



# 2009 Minerals Yearbook

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## CHILE

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# THE MINERAL INDUSTRY OF CHILE

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Chile's position in the world mineral economy was as a leading supplier of many minerals in crude form, ores, and concentrates, especially metals associated with the mining of copper and industrial minerals (such as lithium carbonate) obtained from mining the salars and arid areas in the country. At the end of 2009, the country was estimated to have the leading reserves of copper, lithium, rhenium, and selenium in the world; the second ranked reserves of iodine; and the third ranked reserves of molybdenum. Chile was also estimated to have globally significant (equal to or greater than 5% of the world total) reserves of gold and silver, at least partially owing to substantial gold and silver reserves associated with the copper reserves at some of the major porphyry copper deposits in the country. Although Chile was estimated to have accounted for less than 2% of global potash reserves, the country's reserves of potash appeared to have ranked seventh in the world (table 3; Angulo, 2010b; Edelstein, 2010; George, 2010a, b; Jasinski, 2010; Jaskula, 2010; Polyak, 2010a, b; Servicio Nacional de Geología y Minería, 2010, p. 14-16, 47-55).

In 2009, Chile remained the world's leading copper producer, accounting for 34% of the total world mine production of copper. The country was also the world's leading producer of iodine, rhenium, and lithium (mostly in the form of lithium carbonate), and was estimated to have accounted for about 59%,<sup>1</sup> 48%, and 41%,<sup>1</sup> respectively, of global mine production. Chile was estimated to have been the world's second ranked producer of arsenic and refined copper, accounting for an estimated 21% and about 18%, respectively, of world production. The country was the world's third ranked producer of molybdenum and mined boron (ulexite), accounting for about 16% and an estimated 13%,<sup>1</sup> respectively, of world production. It was estimated to have been the fourth ranked producer of refined selenium and to have accounted for about 5%<sup>1</sup> of global production. Chile was estimated to have ranked fifth in the world in mine production of pumicite and to have accounted for about 5% of global production. The country was the world's sixth ranked producer of silver and accounted for about 6% of global mine output; it also accounted for about 2% of the world's mine production of gold. Chile was estimated to have accounted for about 2% of global production of sulfur, potash (K<sub>2</sub>O content), and salt (NaCl), and between 1% and 2% of diatomite (Angulo, 2010a, b; Brooks, 2010; Comisión Chilena del Cobre, 2010a, p. 134-135, 138-139, 141-143; Crangle, 2010a, b; George, 2010b; Jasinski, 2010; Jaskula, 2010; Kostick, 2010; Ober, 2010; Polyak, 2010b).

## Minerals in the National Economy

In 2009, total mine production accounted for about 15.5% (\$25 billion<sup>2</sup>) of the country's gross domestic product (GDP)

compared with 17.6% (\$30 billion) in 2008, and copper mine production was valued at \$22 billion compared with \$26.5 billion in 2008. In real terms,<sup>3</sup> the total value of mine production in Chile decreased by about 1.4% in 2009 compared with that of 2008, although the total value of the country's copper mine production decreased by only 0.1% (basically remained the same). The real value of all noncopper mine production in Chile, however, decreased by 7.15% (led by decreases in the value of production of iron ore and many industrial minerals) during the same timeframe (Banco Central de Chile, 2010a, p. 40, 44; Comisión Chilena del Cobre, 2010a, p. 71; International Monetary Fund, 2010; Servicio Nacional de Geología y Minería, 2010, p. 13, 19-20, 45-46).

The mineral trade balance of Chile (including crude petroleum and natural gas) increased to about \$19.2 billion compared with about \$18.8 billion in 2008. The value of the country's exports of nonfuel mineral products (the leading mineral export sector) decreased to \$31 billion from about \$40 billion in 2008, and the value of the country's imports of mineral fuels and related materials (the leading mineral import sector) decreased to \$9 billion from \$16 billion in 2008. The value of copper exports (total copper contained in exported ores, concentrates, primary metal, and scrap) decreased to \$27 billion from \$33 billion in 2008. Despite the substantial decrease in the value of copper exports in 2009, copper exports accounted for about 88% of the total value of all mining exports (\$30.6 billion) and about 51% of the total value of all Chilean exports of goods and services (\$53 billion) compared with about 86% (of the country's \$38.2 billion in mining sector exports) and about 50% (of the country's approximately \$66.5 billion in total exports) in 2008 (Banco Central de Chile, 2010b, p. 31, 35, 53, 55, 61).

In 2009, Chile imported about 98% (by volume) of the crude petroleum that was used to produce petroleum refinery products in the country (including diesel fuel) compared with 98.7% in 2008. In addition, the country directly imported 31.6 million barrels (Mbb) of diesel (which accounted for 55% of Chile's total consumption of 57.2 Mbb) of diesel during 2009 compared with about 37.7 Mbb of diesel (which accounted for 61% of Chile's total consumption of 61.7 Mbb of diesel) in 2008. The average annual import price of crude petroleum decreased to about \$56 per barrel compared with \$97 per barrel in 2008, and that of diesel fuel decreased to about \$73 per barrel compared with \$135 per barrel in 2008. In terms of both the value and the volume of the country's consumption in 2008 and 2009, diesel was by far the leading petroleum refinery product consumed in Chile and accounted for about 49% of the country's total consumption of petroleum refinery products (by volume) in 2009 compared with 51% in 2008. Despite the dramatic decreases in import prices for crude petroleum and

<sup>1</sup>Excludes production by the United States, if any.

<sup>2</sup>Where necessary, nominal values have been converted from Chilean pesos (Ch\$) to U.S. dollars (US\$) at an annual average exchange rate of

Ch\$522.46=US\$1.00 for 2008 and Ch\$566.25=US\$1.00 for 2009. All values are nominal, at current prices, unless otherwise stated.

<sup>3</sup>Real values are adjusted for inflation using constant 2003 prices.

diesel fuel in 2009, Chile's consumption of diesel fuel (and some other petroleum refinery products) decreased. Despite an increase in the price of natural gas to an annual average price of \$464 per cubic meter (diesel averaged about \$457 per cubic meter) in 2009 compared with \$404 per cubic meter of natural gas (and \$848 per cubic meter of diesel) in 2008, the share of natural gas as a source of energy to generate electricity increased during this timeframe. Other than simply because of the relative cost per volume of fuel, this increase in demand for natural gas could have been owing to the relative efficiency of burning natural gas to generate electricity and at least partially to increased availability of imported natural gas, including through the startup of operations at the liquefied natural gas (LNG) regasification (of imported LNG) plant at Quintero in August 2009. During 2009, the distribution of the leading sources of energy used to produce electricity in Chile was estimated to be about 43% generated from hydropower; 28%, from coal; 18%, from diesel; 9%, from natural gas (including regasified LNG); and the remainder from other fuel sources compared with 42%, 27%, 24%, 5.6%, and the remainder from other sources, respectively, in 2008 (Empresa Nacional del Petróleo, 2009, p. 54; 2010, p. 55-56, 76; Comisión Nacional de Energía, 2010b-f).

In 2008 (the latest year for which data were available), mineral fuel consumption by the mining sector directly accounted for about 14% of Chile's total consumption of diesel fuel but for only about 9% of the country's consumption of all petroleum refinery products. The mining sector also indirectly consumed a substantial volume of mineral fuels through the sector's use of electricity and accounted for about 37% of the country's total electricity consumption. In turn, electricity generation accounted for 80% of Chile's total consumption of coal, 29% of the country's total consumption of diesel, and about 21% of Chile's total consumption of natural gas. Mineral fuel requirements to mine copper in Chile continued to increase in 2009. On average, about 6,760 megajoules (MJ) of energy from combustion of mineral fuels was estimated to be required to produce 1 metric ton (t) of copper contained in ore by open pit mining methods in Chile and 1,530 MJ was estimated to be required if the copper mine was underground compared with about 5,630 MJ and 1,300 MJ, respectively, in 2008. (Underground mines consumed far less mineral fuels per metric ton of copper produced, on average, than open pit mines.) The average amount of electricity used to produce 1 t of copper from an open pit mine in the country also increased to about 730 MJ compared with 655 MJ of electrical power in 2008, although the average amount of electricity used to produce 1 t of copper from an underground mine (which used substantially more electricity than open pit mines) in Chile decreased to 1,970 MJ compared with 2,100 MJ in 2008. An index of total unit costs to produce copper by the 10 leading private copper mines in Chile plus the state-owned copper mining company Corporación Nacional del Cobre (CODELCO) indicated that average total costs (including expenditures for all inputs into production) for these companies to produce copper increased by about 3.9% compared with that of 2008, which was far below the increase of 33.3% in 2008 compared with that of 2007. Separate data were not available for just the average energy costs to produce a unit of copper in

Chile (Comisión Chilena del Cobre, 2010a, p. 11, 80-81, 90; Comisión Nacional de Energía, 2010a; Servicio Nacional de Geología y Minería, 2010, p. 36-37).

At current prices, labor costs in the mineral industry of Chile continued to increase during 2009. The total wage bill for all mining and the extraction of crude petroleum in the country increased to \$2.67 billion compared with about \$2.11 billion in 2008. In 2009, mining and the extraction of crude petroleum employed 62,102 workers, which was lower than the 64,268 workers reported as employed in these sectors in 2008 but still more than the reported number of 58,319 workers employed in these same sectors in 2007. In 2009, the copper mining sector in Chile employed 48,575 workers compared with 50,256 in 2008; the industrial minerals sector employed 7,034 workers compared with 7,047 in 2008; primarily gold and silver mining companies employed 3,393 workers compared with 3,549 in 2008; primarily iron and manganese mining companies employed 1,563 workers compared with 1,569 in 2008; companies that primarily extracted crude petroleum employed 1,178 workers compared with 1,497 in 2008; and coal mining employed 359 workers compared with 350 in 2008. The average annual salary per worker in the copper sector increased substantially to \$48,689 in 2009 compared with \$35,961 in 2008; crude petroleum, \$39,719 compared with \$29,136; iron ore, \$30,292 compared with \$29,353; and lithium, \$29,452 compared with \$22,124; the average annual salary of workers employed in mining any other mineral in Chile was significantly (at least greater than 6.8%) less than \$30,000 in 2009 (Servicio Nacional de Geología y Minería, 2009, p. 17-18; 2010, p. 17-18).

In 2009, total investment in the mining sector of Chile decreased to just slightly greater than \$2.7 billion compared with about \$4.4 billion in 2008. This decrease was mostly owing to a decrease of 57% in foreign direct investment (FDI) into the sector to \$1.01 billion compared with about \$2.37 billion in 2008, although the 2009 level of FDI in the sector was still far greater than the \$0.30 billion of FDI in the sector realized in 2007. In 2009, public investment in mining (including investment by CODELCO) decreased to \$1.7 billion compared with about \$2.0 billion in 2008. In 2007, the low level of FDI could have been owing to uncertainty surrounding labor negotiations at some mines in Chile and possibly to lingering political uncertainty surrounding implementation of a mining-specific tax in 2006. In 2009, the decrease in FDI in the sector could have been owing more to an average decrease in demand and prices for most of the minerals produced in Chile compared with that of 2008, although uncertainty concerning recurring labor negotiations at mining operations in Chile could have been (and may continue to be) an ongoing deterrent to FDI in the sector (Comisión Chilena del Cobre, 2010a, p. 72-73, 123; McMahon and Cervantes, 2010, p. 6-10, 12, 25).

## Government Policies and Programs

During 2009, no notable changes were made in the mining legislation of Chile. On June 16, 2005, the Government approved Law 20.026 to establish a mining-specific tax (royalty), which modified both the applicable Mining Code (royalty), which modified both the applicable Mining Code (approved on September 26, 1983) and the 1974 foreign

investment statute, known as Decree Law 600 (D.L. 600). The tax, which is assessed on a per-company basis, took effect at the beginning of 2006 and applies only if the total value of mine production by a single company exceeds the average value of 12,000 t of copper during the year. Before passage of the new mining-specific tax law, the most recent significant modifications of the Mining Code had been through approval of a Mining Safety Act on December 30, 2002. The main environmental law was Decree Law 19.300, which was approved on March 9, 1994, but this law was supplemented on December 7, 2002, by approval of Decreto Supremo 95, a Government decree that requires environmental impact statements (EISs) for any new investment projects that involve either exploration for or extraction of the country's natural resources (including minerals). Decreto Supremo 95 is the primary statute for environmental regulation of mining concessions in Chile (Rojas and others, 2006, p. 360-362; Comisión Chilena del Cobre, undated).

In 2006, the Government passed the Fiscal Responsibility Law (FRL) that created two funds to manage increased revenues from mining royalty payments combined with increased revenues from CODELCO. The FRL extended the commitment of the Government to a structural fiscal surplus rule that was established in 2000 to help insulate the economy from fluctuations in mineral commodity prices. During a boom period (as during 2007), this rule allows the Government to spend only the portion of the surplus revenue that is considered permanent and to save the transitory portion. As part of the FRL, a panel of six members was selected to form a financial advisory council to advise the Minister of Finance concerning investment guidelines and other matters related to the two funds, including helping to determine what portion of the surplus mining revenues was permanent and what portion was transitory. (Transitory Government surpluses from the copper sector have been termed "copper windfall revenues.") The first fund is called the Economic and Social Stabilization Fund (ESSF) and was established with an initial investment of about \$6 billion in 2006, mostly from the closure of the old Copper Stabilization Fund (established in 1985); the second fund is called the Pension Reserve Fund and was established with an initial investment of \$600 million. At the end of 2009, these funds contained about \$11.3 billion and \$3.42 billion in assets compared with \$20.2 billion and \$2.51 billion, respectively, at yearend 2008 (International Monetary Fund, 2009, p. 60; Kumhof and Laxton, 2009, p. 25; Ministerio de Hacienda, 2010, p. 10).

The Chilean Government, through the Ministerio de Minería, exercises control of the mineral industry through three state-owned companies and four regulatory agencies. The state-owned companies that are important to the mineral industry include CODELCO, some subsidiaries of Corporación de Fomento de la Producción (CORFO), and Empresa Nacional de Minería (ENAMI). The specific subsidiaries of CORFO that are important to the mineral industry include Cía. Chilena de Electricidad S.A., Empresa Nacional del Carbón S.A. (ENACAR), and Empresa Nacional del Petróleo S.A. (ENAP). The four regulatory agencies are Comité de Inversiones Extranjeras (CIE), Comisión Chilena del Cobre (COCHILCO), the Comisión Nacional del Medio Ambiente (CONAMA),

and the Servicio Nacional de Geología y Minería (SERNAGEOMIN).

## Production

In 2009, effects of the global economic downturn on the production of minerals in Chile varied substantially. Production of all ferrous metals and manganese in Chile decreased by greater than 10% (and by up to almost 80% for ferrochromium) compared with that of 2008, apparently owing to Chilean producers' responses to decreased global demand for these minerals and products based on these minerals (particularly to the decrease in global demand for steel) during this timeframe. Production of mined lead and zinc decreased by 62% and about 31%, respectively, compared with that of 2008 mostly owing to Breakwater Resources Ltd. of Canada's decreased production of these metals at El Toqui Mine and its shift toward a proportionally greater production of gold in concentrates at the mine during 2009 (table 1; Breakwater Resources Ltd., 2010, p. 16, 22; CAP S.A., 2010, p. 2-3).

In Chile, production of arsenic, molybdenum, rhenium, selenium, and silver was either mostly or exclusively as a byproduct of copper processing, and the copper content of mine production in the country increased by about 1.2% compared with that of 2008. In 2009, about 61% of the copper content of the country's mine output of ores and concentrates was further processed domestically to produce refined copper. Production of electrowon copper cathodes at solvent-extraction/electrowinning (SX-EW) plants at many of the copper mines in Chile accounted for about 65% of the country's total production of refined copper. After use in domestic SX-EW plants in Chile, the amount of copper contained in concentrates that remained available for export or for smelting (or otherwise processing) in the country decreased to about 3.28 million metric tons (Mt) compared with about 3.36 Mt in 2008, but the country's exports of copper contained in concentrates decreased to about 1.8 Mt compared with 2.0 Mt in 2008. This decrease in exports appears to have allowed the country to produce about 11% more smelter copper during this timeframe. Any associated production of arsenic at copper smelters in Chile was assumed to have also decreased in close proportion with the decrease in primary copper smelter production (tables 1, 2; Comisión Chilena del Cobre, 2010a, p. 19, 25, 39; Servicio Nacional de Geología y Minería, 2010, p. 68-70, 75-76).

Production of selenium metal was estimated to have increased again in 2009 compared with that of 2008 owing to an apparent continuation in the ramping up of production, including installation of a fifth selenium roasting furnace as part of an expansion of the noble metals plant at CODELCO's Ventanas refinery complex. The expansion at Ventanas also resulted in an increase in the production of refined silver (granules) compared with that of 2008, although mine output of silver in Chile decreased significantly during this timeframe. In 2009, 60% of the country's mine output of silver and 35% of gold was produced at copper mines compared with about 56% and 36%, respectively, in 2008 (table 1; Corporación Nacional del Cobre, 2008, p. 40-41; 2010a, p. 20, 48, 51; Comisión Chilena del Cobre, 2010a, p. 23, 25).

Chile's globally significant production of industrial minerals was highly dependent on the mining of the brines and caliche ores contained in the salars and arid areas, respectively, in the northern part of the country. The country's total production of potash ( $K_2O$  equivalent) increased by 23.6% compared with that of 2008 mostly owing to Sociedad Química y Minera de Chile S.A. (SQM)'s continuing expansion of the company's production of potassium-based products in the Salar de Atacama. Production of iodine increased by about 12% compared with that of 2008 almost entirely owing to SQM increasing production to about 10,100 t of iodine from caliche ore deposits compared with about 8,330 t of iodine produced by the company in 2008. Production of lithium carbonate decreased by about 48% compared with that of 2008 owing to apparent decreases in production of lithium from the brines of the Salar de Atacama by both of the main producers there. Plant production of boric acid decreased by 31% compared with that of 2008 primarily owing to decreased production by SQM (Servicio Nacional de Geología y Minería, 2009, p. 15, 48, 52-53; Sociedad Química y Minera de Chile S.A., 2009, p. 20-21; 2010, p. 14-17, 27, 31-32; Atacama Minerals Corp., 2010, p. 2; Rockwood Holdings Inc., 2010, p. 40, 47).

In 2009, production of most other industrial minerals in Chile decreased compared with that of 2008, and this could have been owing to a widespread response by industrial minerals producers to possible decreases in demand for those minerals. Notable exceptions were a 34% increase in the country's production of ground calcium carbonate, a 30% increase in the production of salt, a 16% increase in the production of refractory clay, and a 12% increase in the production of quartz (unspecified) compared with that of 2008. In percentage terms, production of lapis lazuli and marble increased dramatically during this timeframe, but the volumes of production of these ornamental stones appeared to be only of local significance. A Chilean cement company, Cementos Bío Bío S.A., reported that demand for lime in the country had been fairly constant at between 1 million metric ton per year (Mt/yr) and 1.1 Mt/yr from 2005 through 2009, so this information was combined with reported data on the country's annual imports and exports of lime during these years to estimate the revised figures for production of lime in table 1 (table 1; Otegui, 2005; Cementos Bío Bío S.A., 2010, p. 38).

In 2009, the production of coal in Chile increased by about 19% compared with that of 2008 apparently owing to increased production from the Pecket deposit in the Magallanes coal basin in Region XII. Production of methanol decreased by about 13% compared with that of 2008 owing to some technical issues at the site of the methanol production facilities of Methanex Corp. of Canada, which was still adapting to using more domestically produced natural gas to produce methanol since shortages of natural gas imports from Argentina (for the company's use) began in mid-2007. In table 1, production of crude petroleum is reported to have increased by about 40% compared with that of 2008 mostly owing to SERNAGEOMIN reporting production by GeoPark Chile Ltd. (a subsidiary of GeoPark Holdings Ltd., which is registered as incorporated in Bermuda and with head offices in Argentina) for the first time in 2009. GeoPark claims to have been producing oil and natural gas from the Fell Block in Region XII of Chile since 2006, however, and it is uncertain

whether production by GeoPark in Chile has been included in the data on the country's production of crude petroleum and natural gas for 2006, 2007, or 2008 in table 1 (table 1; GeoPark Holdings Ltd., 2010, p. 19-22, 43, 68; Methanex Corp., 2010, p. 5-6; Servicio Nacional de Geología y Minería, 2010, p. 133-136).

## Structure of the Mineral Industry

In 2009, many of the world's leading private mining companies, which included Anglo American plc and Antofagasta plc of the United Kingdom, Barrick Gold Corp. and Teck Cominco Ltd. of Canada, BHP Billiton Ltd. and BHP Billiton plc of Australia and the United Kingdom (BHP Billiton), Freeport-McMoRan Copper & Gold Inc. of the United States, K+S Aktiengesellschaft (K+S AG) of Germany, Rio Tinto Ltd. and Rio Tinto plc of Australia and the United Kingdom (Rio Tinto), and Xstrata plc of Switzerland, were deeply invested in the mining sector of Chile. GeoPark was added to table 2 as a producer of petroleum and natural gas in Chile during 2009, and the company claimed to be the first and only private oil and natural gas producer in Chile (table 2; GeoPark Holdings Ltd., 2010, p. 2).

The leading Chilean-owned companies in the mineral industry were CAP S.A., CODELCO, Molibdenos y Metales S.A. (MOLYMET), and SQM; CAP, MOLYMET and SQM were privately owned. In 1987, the privatization of partially state-owned Compañía de Acero del Pacífico S.A. was completed to form CAP, which controlled most of the production of ferrous metals in the country. State-run CODELCO was the leading copper mining company in the world. In 2009, SQM appeared to be the leading producer of iodine in the world, and the company estimated that the tonnage of its iodine sales accounted for 25% of the total volume of iodine sales in the world; SQM also appeared to be the leading producer of lithium carbonate in the world, and the company estimated that the total tonnage of its sales of lithium compounds (including lithium hydroxide and lithium chloride) accounted for about 31% of the world's demand for lithium compounds. SQM also claimed to be the leading producer of natural potassium nitrate in the world (the company estimated that the tonnage of its sales of potassium nitrate accounted for approximately 50% of the global volume of sales in 2009). In December 2008, SQM reopened the Iris iodine production facilities, but the company stopped production of iodine at Iris from August 2009 through the end of the year. In 2009, SQM's total reported capacity to produce iodine (listed in table 2) appeared to include the iodine production capacity of the Iris facilities. In 2009, SQM increased the company's potash production capacity in the Salar de Atacama to a maximum of slightly greater than 1.5 Mt/yr of potassium chloride (KCl), which was about 955,000 metric tons per year (t/yr) in  $K_2O$  equivalent, compared with about 650,000 t/yr of KCl and 300,000 t/yr of potassium sulfate ( $K_2SO_4$ ), which together amounted to about 820,000 t/yr in  $K_2O$  equivalent in 2008. This increase was owing to SQM's expansion of the company's KCl production capacity to 1.05 Mt/yr of KCl (compared with 650,000 t/yr of KCl in 2008) and to conversion of the company's  $K_2SO_4$  production facilities to be of dual-use, with

a capacity to produce either 460,000 t/yr of KCl, 300,000 t/yr of K<sub>2</sub>SO<sub>4</sub>, or lesser tonnages of both forms of potash during the year (compared with a capacity to produce only 300,000 t/yr of K<sub>2</sub>SO<sub>4</sub> in 2008) (table 2; Sociedad Química y Minera de Chile S.A., 2009, p. 20, 33; 2010, p. 15, 17-18, 23, 31-32; CAP S.A., 2010, p. 7-8, 22; Corporación Nacional del Cobre, 2010a, p. 6).

## Mineral Trade

In 2009, the leading exports of metallic and industrial minerals of Chile were, in decreasing order of value, copper, molybdenum, gold, iron ore, iodine, silver, potash (KCl only), nitrates, salt, and lithium carbonate, and the country remained by far the world's leading copper exporter (by volume). Chile exported about 5.4 Mt of total copper in both 2008 and 2009; the country's total copper exports included about 3.2 Mt of refined copper and about 1.8 Mt of copper contained in concentrates in 2009 compared with 3.0 Mt and 2.0 Mt, respectively, in 2008. In 2009, in decreasing order of volume exported, the leading country destinations for Chile's exports of refined copper were China, the United States, and the Republic of Korea; for exports of copper in concentrates, they were Japan, China, and India. In 2008, the three leading destination countries for Chile's exports of copper in concentrates were the same as in 2009, but for the country's exports of refined copper, they were, in decreasing order of volume exported, China, Italy, and the United States. In 2009, Chile's exports of refined copper to China increased to 1,159,000 t compared with 606,300 t in 2008, and China's share of Chile's total copper exports (by volume) increased to 33% compared with 20% in 2008 (Comisión Chilena del Cobre, 2010a, p. 29, 39, 45, 47, 51, 60, 156).

The following information on Chile's mineral exports is presented by mineral exported in decreasing order of export value in 2009. The total molybdenum content of Chile's exports decreased to about 56,400 t compared with about 58,800 t in 2008 despite an increase in the country's exports of molybdenum contained in molybdenum oxides to 35,400 t compared with 28,400 t during the same timeframe. The decrease in total molybdenum exports was owing to decreases of between 18% and 36% (by volume) in Chile's exports of molybdenum contained in concentrates, ferromolybdenum, and molybdenum trioxide. The country's exports of gold metal increased to 30,100 kilograms (kg) compared with 26,500 kg in 2008; that of total iron ore (including pellets) increased to 8.4 Mt compared with about 6.3 Mt in 2008; that of iodine decreased to 13,400 t compared with 15,800 t in 2008; that of silver metal increased to 717 t compared with 701 t in 2008; that of potash (KCl) increased to 449,000 t compared with 54,800 t in 2008; that of nitrates decreased to 233,000 t compared with 330,000 t in 2008; that of salt increased to 6.8 Mt compared with 5.6 Mt in 2008; and that of lithium carbonate decreased to about 22,400 t compared with 42,600 t in 2008 (Comisión Chilena del Cobre, 2010a, p. 30, 61).

In 2009, Chile appeared to have begun to solve some difficulties with securing supplies of mineral fuels to run the country's powerplants. In both 2008 and 2009, coal was the leading mineral fuel used in powerplants to generate electricity in Chile, and the country needed to import only 6.0 Mt of coal

(for all uses, including thermal and metallurgical) compared with about 6.7 Mt in 2008. In 2009, the leading country sources of imported coal were Colombia (which accounted for 73% of Chile's total coal imports during the year), Indonesia (11%), and the United States (11%), and none of the remaining source countries accounted for greater than 2% of Chile's imports of coal; in 2008, the leading sources of imported coal were Colombia (63%), the United States (13%), Australia (9%), Indonesia (7%), and Canada (6%), and none of the remaining source countries accounted for greater than 1% of Chile's imports of coal. Diesel fuel was the second ranked mineral fuel used for the generation of electricity in Chile, and the country also decreased its total imports of diesel (for all uses) by 16% compared with that of 2008. In 2009, the source countries for Chile's imports of diesel fuel were the Republic of Korea (which accounted for 68% of Chile's total imports of diesel during the year), Japan (27%), and Canada (5%) compared with the United States (57%), the Republic of Korea (28%), Japan (14%), and unspecified (1%) in 2008 (Comisión Nacional de Energía, 2010a, c-f).

In 2009, about 19% of the electricity generated from combustion of natural gas in powerplants in Chile was accounted for by the combustion of LNG. The country's sources of LNG were Equatorial Guinea (which accounted for 59% of Chile's total imports of LNG during the year), Trinidad and Tobago (27%), and Qatar (14%) compared with zero Chilean imports of LNG from any country in 2008. Chile's imports of natural gas (in gaseous form) decreased to 1.07 billion cubic meters in 2009 compared with about 1.12 billion cubic meters in 2008, and the country's imports of natural gas for energy use (excluding that imported for petrochemical use in Magallanes) appeared to have been decreasing since a recent peak in imports of 5.14 billion cubic meters in 2004. The source country for 100% of Chile's imports of natural gas (in gaseous form) from at least 1999 through 2009 was Argentina (Olson, 2009; Comisión Nacional de Energía, 2010c-f).

Sulfuric acid is an important chemical for mineral industries, and Chile annually exported only a small fraction of the volumes of sulfuric acid produced in the country. In 2009, Chile exported about 14,000 t of sulfuric acid compared with 84,000 t in 2008. However, Chile imported 1.9 Mt of sulfuric acid in 2009 compared with 2.4 Mt in 2008, and the country produced about 5.0 Mt of sulfuric acid compared with 4.8 Mt in 2008. Thus, the decrease in imports of sulfuric acid in 2009 appeared to be owing to an increase in Chile's production of sulfuric acid and to a decrease to about 6.8 Mt of apparent use of sulfuric acid in the country compared with about 7.1 Mt in 2008 (Comisión Chilena del Cobre, 2010a, p. 82).

## Commodity Review

### Metals

**Copper.**—Production of copper increased to 1.7 Mt compared with about 1.5 Mt at CODELCO mines in 2008, mostly owing to an increase in production by the CODELCO Norte Division to about 875,000 t of copper compared with 755,000 t in 2008 and the completed ramping up of production by Minera Gaby S.A. (a wholly owned CODELCO subsidiary) to produce 148,000 t

of copper compared with 67,700 t in 2008. In 2009, production of copper increased in the CODELCO Norte Division apparently owing mostly to an adjustment to the division's mining plan (made during the final quarter of 2008) that called for increased volumes and higher grades of ore to be mined and processed at the Chuquicamata Mine. Part of the increase in production within this division could also have been owing to an increase in the volume of sulfide ore being produced at the Radomiro Tomic Mine and transported to the concentrator plants at Chuquicamata as part of CODELCO's Radomiro Tomic Sulfide Mining project (which the company began implementing in August 2008, although it was not expected to be completed until sometime in 2010) (Corporación Nacional del Cobre, 2009a, p. 9, 49-50, 231; 2010a, p. 48, 66; Comisión Chilena del Cobre, 2010a, p. 19).

Production of copper at the Escondida Mine decreased to 1.1 Mt compared with about 1.3 Mt in 2008, and this decrease in 2009 followed a decrease in production of copper at the mine in 2008 compared with 1.5 Mt of copper produced at Escondida in 2007. The decrease in production in 2008 was mostly owing to the failure of a SAG mill in the Laguna Seca concentration plant at Escondida, although the plant continued to operate at a reduced capacity through the end of the year, and was also owing to Minera Escondida Ltda. mining lower ore grades at the mine, on average, than in 2007. In 2009, the decrease in production was owing to a complete closure of the Laguna Seca plant during at least all of July while the mill was being repaired, and to the mining of slightly lower ore grades than in 2008. In 2009, production at the Collahuasi Mine continued to increase to 536,000 t of copper compared with about 464,000 t in 2008 and 452,000 t in 2007. The increase in production at Collahuasi in 2009 appeared to be mostly owing to completion of a concentrator throughput debottlenecking project at the mine during the final quarter of 2008 and commissioning of the project in 2009 (Anglo American plc, 2009, p. 19, 41, 44, 163; 2010, p. 20-21, 44-45, 171; Comisión Chilena del Cobre, 2010a, p. 19; Minera Escondida Ltda., 2010, p. 11).

Reliable data for Chile's annual production of some of the byproducts of copper processing in the country were available for this report, such as data on annual production of molybdenum and sulfuric acid. Reliable data were also available concerning the production of gold and silver metal at CODELCO's Ventanas smelting and refining complex, but detailed information concerning possible production of many other byproducts of copper mining and processing in CODELCO's Ventanas Division and of any other byproducts at other copper mining, smelting, and refining operations in the country was unavailable. For example, CODELCO reported that the company's Ventanas Division has a noble metals plant that could produce gold, palladium, platinum, selenium, silver, and (or) tellurium, but information concerning actual production (if any) of these metals (other than gold and silver) by the company was not available. In 2009, CODELCO reported that the company produced and exported barrels of copper anodic slimes (which could also contain these same metals in varying proportions, plus other minerals), and that company sales of other byproducts of copper processing (including sales of barrels of anodic slimes, precious metals, sulfuric acid, and

other byproducts, but not including sales of molybdenum) accounted for about 12% of total revenues during the year. Reliable information was not available, however, with respect to CODELCO's (or any other company in Chile's) possible production of barrels of anodic slimes, palladium, platinum, selenium, and (or) tellurium, including neither data on the actual number of barrels of anodic slimes produced or exported during the year or detailed information concerning the actual (or average) quantities of metals (or other minerals) possibly contained within the barrels (Corporación Nacional del Cobre, 2008, p. 40-41; 2009b, p. 21, 38, 102-103, 178; 2010b, p. 43, 45, 65-66, 88, 201; Comisión Chilena del Cobre, 2010a, p. 21, 23, 25, 82).

COCHILCO reported that the value of Chile's exports of copper byproducts (including anodic slimes, doré, selenium, silver, and other byproducts; not including molybdenum in concentrates or other molybdenum products, such as molybdenum oxides) increased to about \$440 million compared with \$396 million in 2008. The leading country destinations for these non-molybdenum, copper-byproduct exports in 2009 were the United States (accounted for \$240 million of Chile's exports of these copper byproducts), Belgium (\$56 million), Mexico (\$46 million), and the Republic of Korea (\$33 million) compared with the United States (\$192 million), Mexico (\$85 million), Belgium (\$47 million), and Brazil (\$46 million) in 2008. Reported data on the volumes of Chile's exports of copper anodic slimes, palladium, platinum, selenium, and (or) tellurium (if any) were not available (Comisión Chilena del Cobre, 2009; 2010b).

**Gold.**—In 2009, production of mined gold in Chile increased by about 4.3% compared with that of 2008 mostly owing to increased production by large-scale and small-scale gold mines. Among larger-scale gold mining companies operating in the country, Kinross Gold Corp. of Canada increased production of gold by about 470 kg compared with that of 2008 (mostly at the company's Maricunga Mine), although the company did not increase production as much as expected at the company's La Coipa Mine owing to a labor strike during all of July 2009. Company-level information was not available for production levels by small-scale gold mining companies in Chile, but small-scale gold mining companies in the country increased production to 2,241 kg of gold (combined) compared with 1,394 kg of gold in 2008. Copper mining companies in Chile (combined) increased production of gold to 14,250 kg compared with 14,037 kg in 2008 (table 1; Comisión Chilena del Cobre, 2010a, p. 23; Kinross Gold Corp., 2010, p. 2, 11, 36, 46-48).

Barrick Gold Corp. of Canada (100% owner) expected the Pascua Lama gold project to begin production sometime in 2013, and to ramp up to a production of between 23,000 kg/yr and 25,000 kg/yr of gold by 2014. Another (expected) major gold project was Cerro Casale, and a feasibility study had been completed for Cerro Casale by the owners (Barrick, 50%, and Kinross, 50%). Information concerning a definitive timeline until the first expected production of gold at Cerro Casale was still not available, however, apparently because the owners were still in the process of deciding whether to approve the project for construction and securing the necessary mining permits. If and whenever production might be ramped up at Cerro Casale, the mine was expected to produce between 30,000 kg/yr and

34,000 kg/yr of gold (table 1; Barrick Gold Corp., 2010, p. 13, 39, 60, 72; Comisión Chilena del Cobre, 2010a, p. 23; Kinross Gold Corp., 2010, p. 5, 13, 35).

**Lead, Silver, and Zinc.**—In 2009, production of mined silver in Chile decreased by about 7% mostly owing to a decrease in the combined production of silver at gold mines in the country to about 518 t compared with 604 t of silver in 2008, and partially owing to a decrease in the combined production of silver at copper mines in Chile to about 779 t compared with 792 t of silver in 2008. In 2009, the leading producer of silver that was not a byproduct of copper processing appeared to be Yamana Gold Inc. of Canada's El Peñón Mine, and the company produced about 305 t of silver in 2009 compared with 307 t in 2008 at El Peñón. The second ranked noncopper producer of silver appeared to be Kinross's La Coipa Mine, and the company produced about 164 t of silver in 2009 compared with 177 t in 2008 at La Coipa. Thus, it appears that the decrease in Chile's production of mined silver during this timeframe was mostly owing to decreased production at La Coipa Mine (table 1; Comisión Chilena del Cobre, 2010a, p. 25; Kinross Gold Corp., 2010, p. 5, 46-47; Yamana Gold Inc., 2010, p. 54)

In 2009, Breakwater Resources appeared to be the leading producer of mined lead and zinc in Chile, although production of gold and silver in concentrates at the company's El Toqui Mine accounted for only about 3% and 4%, respectively, of the country's total production of these (mined) metals. Breakwater planned to focus mining on more gold-bearing deposits at El Toqui, and to produce less lead, silver, and zinc in 2009. During 2009, however, the company modified the mine plan to produce more zinc at El Toqui in response to zinc prices not decreasing as much as expected. In 2009, production of lead in concentrates at El Toqui Mine decreased to 1,025 t compared with 2,796 t in 2008, that of silver in concentrates decreased to about 7,260 kg compared with about 10,700 kg in 2008, and that of zinc in concentrates decreased to 19,635 t compared with 31,992 t in 2008. In 2010, the company expected to increase production of mined zinc to about 23,000 t, but to further decrease production of mined lead to about 600 t and that of mined silver to about 2,600 kg. The company planned to focus on mining both gold-bearing and zinc-bearing deposits in 2010 (table 1; Breakwater Resources Ltd., 2010, p. 1, 5-7, 17, 22-23; Comisión Chilena del Cobre, 2010a, p. 25; Servicio Nacional de Geología y Minería, 2010, p. 79-81).

**Molybdenum and Rhenium.**—Production of molybdenum oxide within the CODELCO Norte Division is all that is reported in table 1, and the company's reported production increased by about 26% compared with that of 2008. This increase in reported production is consistent with the increase in the country's total exports to 35,386 t of molybdenum oxide compared with 28,431 t in 2008. Production by CODELCO was equal to only about 20% of Chile's total exports of molybdenum oxide in both 2008 and 2009, because MOLYMET appeared to be (by far) the leading processor of molybdenum in concentrates and producer and exporter of molybdenum oxide in the country. MOLYMET's Chilean sources of molybdenum in concentrates included the four mining divisions of CODELCO (not including the Ventanas Division of CODELCO or Minera Gaby), Anglo American Sur S.A. (Los Bronces Mine), Compañía Minera

Doña Inés de Collahuasi SCM (Collahuasi Mine and plant), and Compañía Minera Los Pelambres S.A. (Los Pelambres Mine and plant). Other company sources of molybdenum concentrates processed in 2009 by MOLYMET were the Compañía Minera Antamina S.A. and Southern Copper Corp. of Peru; Mexicana de Cobre S.A. de C.V. of Mexico; Highland Valley Copper (97.5% owned by Teck Cominco) of Canada; and Kennecott Molybdenum Co. (100% owned by Rio Tinto) of the United Kingdom, among others (table 1; Comisión Chilena del Cobre, 2010a, p. 21, 30; Jara, 2010, p. 20-22; Molibdenos y Metales S.A., 2010, p. 27).

In 2009, MOLYMET operated its main molybdenum processing (roasting) plant at its Nos facilities in Chile and also had molybdenum roasting capacity at company plants in Belgium and Mexico. MOLYMET reported an estimated combined capacity to produce about 66,000 t/yr of molybdenum oxide. The company also produced ammonium perrhenate (used in the production of rhenium metal and perrhenic acid), ferromolybdenum, molybdenum dioxide, molybdenum metal, molybdenum salts, and rhenium metal (briquets and powder), but separate data for how much of these mineral materials and chemicals were produced in Chile were not available. In 2009, the company (as a whole, including foreign subsidiaries) produced about 51,600 t of molybdenum oxide and 13,800 t of ferromolybdenum compared with 59,700 t and 22,900 t, respectively, in 2008. At MOLYMET's Nos facilities in Chile, the company had an estimated processing (roasting) capacity of approximately 45,000 t/yr of molybdenum contained in concentrates, but there was a fire at the plant in September 2009. Exact quantitative information concerning the effects of the fire on the company's (molybdenum) processing or (molybdenum products and byproducts) production capacity at the Nos facilities was not available. The company planned to complete a new molybdenum processing plant at Mejillones in Chile and to begin production of molybdenum oxide there sometime in 2010. The designed roasting capacity of this new plant was expected to be about 14,000 t/yr of molybdenum in concentrates; information concerning whether or not the company would be able to recover ammonium perrhenate as a byproduct of processing molybdenum concentrates at the new plant at Mejillones was not available. MOLYMET only reported that the company had plants to recover and produce rhenium at the company's Nos facilities, so all of the company's rhenium production was expected to have been produced in Chile (table 2; Molibdenos y Metales S.A., 2010, p. 6, 25-28).

### *Industrial Minerals*

**Boron.**—In 2009, production of boric acid in Chile decreased by about 31% compared with that of 2008, and this decrease in production appeared to be almost entirely owing to decreased production by SQM. The company's extraction yield at its boric acid plant in the Salar de Atacama was about 5,000 t of boric acid compared with an approximate 8,000 t in 2008, and the company sold about 3,400 t of boric acid compared with 7,200 t in 2008. Accurate information concerning actual production, inventories, or stockpiles of boric acid by SQM was not available. The company's production was almost entirely



sold regionally (Servicio Nacional de Geología y Minería, 2010, p. 99-101; Sociedad Química y Minera de Chile 2010, p. 27-28, 33, 42, 45, 56).

**Cement and Lime.**—In 2009, all the major cement producers in Chile appeared to reduce cement production compared with that of 2008, and this appeared to be mostly owing to an estimated decrease of about 16% in cement demand within the country. In August 2009, Inversiones Brescia S.A. of Peru acquired about a 99% ownership interest in Empresas Melón S.A. from LaFarge S.A. of France and shortened the cement company's name to Melón S.A. in October. During 2009, Melón sold about 1.3 Mt of cement compared with 1.63 Mt of cement in 2008, although exact information concerning actual production by this company was not available. Cementos Bío Bío attempted to streamline its production lines to be as cost efficient as possible, and the company produced 1.3 Mt of cement compared with about 1.52 Mt of cement in 2008 (including production by Bío Bío's subsidiary Industria Nacional de Cemento S.A.). Cemento Polpaico S.A. planned to reduce production of all its products in the country in 2009 compared with that of 2008, and this plan included closing down a rotary cement kiln line in order to lower excess capacity and reduce the company's costs of cement production. Cemento Polpaico produced about 1.28 Mt of cement compared with 1.47 Mt in 2008 (tables 1, 2; Cementos Bío Bío S.A., 2010, p. 28-31, 164-165; Cemento Polpaico S.A., 2010, p. 4, 34, 81; Holcim Ltd., 2010, p. 18, 67-68; Melón S.A., 2010, p. 7-9, 11, 21, 74-75).

Cementos Bío Bío appeared to be the leading producer of lime in Chile, and the company decreased its total production to about 500,000 t of lime compared with about 530,000 t of lime in 2008. These production levels appeared to include lime production at a company plant in San Juan Argentina (in which, Soprocál Calerías e Industrias S.A. [Soprocál] had a 30% ownership interest), and it could be that Cementos Bío Bío produced only about 420,000 t of lime in Chile in 2009. The company estimated that about 300,000 t of lime was produced in 2009 by other companies in the country for their own use (in the production of cellulose, steel, and sugar, for example), and that approximately 380,000 t of lime was either produced by Soprocál or imported during the year. In 2009, Chile increased imports of lime to about 310,000 t from about 280,000 t in 2008, and Soprocál decreased sales of lime to 73,000 t from about 85,000 t in 2008. Neither detailed information on actual production of lime by Soprocál or how much of Soprocál's lime sales might have been produced at the plant in San Juan Argentina (if any) was available. In both 2008 and 2009, all Chile's imports of lime appeared to be entirely from Argentina, but detailed information concerning how much of Chilean imports of lime might have been produced at Soprocál's plant in Argentina (if any) was not available (Banco Central de Chile, 2010b, p. 83, 118; Cementos Bío Bío S.A., 2010, p. 17-18, 20, 28, 38-39, 88, 114, 130; Soprocál Calerías e Industrias S.A., 2010, p. 4-5, 8-9).

**Iodine and Nitrates.**—Atacama Minerals Corp. increased production of iodine (by heap leaching) to 1,100 t in 2009 from about 840 t in 2008, and the company approved a plan to reconfigure an agitated leach plant to increase production further to 1,500 t/yr of iodine. If Atacama Minerals is successful

in reconfiguring the agitated leach plant then the plant would also be able to produce nitrate feed; in this case, the company planned to construct a fertilizer plant with a production capacity of about 70,000 t/yr of nitrate fertilizer. The company expected that the reconfiguration of the agitated leach plant could be completed by sometime in 2011 (Atacama Minerals Corp., 2010, p. 1-3).

Although SQM increased production of iodine (from caliche ore deposits in northern Chile) by about 1,770 t in 2009, the company's sales of iodine and iodine derivative products decreased by about 3,300 t compared with that of 2008. SQM maintained inventories of iodine, and the company planned to temporarily close the María Elena and the Pampa Blanca plants for some time in 2010. These plant closures were expected to result in a decrease in production of iodine by about 20% in 2010 compared with that of 2009, a decrease in inventories of iodine, and a slight decrease in the production of nitrates by SQM during this timeframe. During 2009, SQM continued construction of a new potassium nitrate production plant as part of its Coya Sur facilities; the plant was expected to increase the company's production capacity by 300,000 t/yr of potassium nitrate and the expansion was expected to be completed by mid-2010. In 2009, SQM's total production of crystallized nitrates (all types) at Coya Sur decreased to 193,000 t compared with 302,000 t in 2008. The company expected that its production of potassium nitrate would increase in 2010, but also expected that any increases in production would be subject to the availability of mineral raw materials, including nitrate salts contained in mined caliche ore and potassium chloride extracted from the brines in the Salar de Atacama that are not used to produce other products (Sociedad Química y Minera de Chile S.A., 2010, p. 5, 14-15, 21, 23-25, 29-31, 42, 48, 65-66).

**Lithium.**—In 2009, SQM decreased production of lithium carbonate to about 14,000 t compared with about 30,000 t in 2008 owing to an overall decrease in global demand and despite completing a capacity expansion to be able to produce 40,000 t/yr of lithium carbonate in 2008. In 2009, the company's sales of lithium-based products decreased to only about 21,300 t compared with 27,900 t in 2008, and SQM expected its sales of lithium carbonate to increase substantially in 2010 mostly owing to an expected increase in global demand for rechargeable batteries compared with that of 2009. The company expected its production of lithium-based products to increase in 2010 as well, but detailed information about possible company inventories of lithium-based products and the possible role of management of these inventories (if any) in sales was not available. Detailed information regarding actual production, production capacities, or (expected) developments in either of these areas by the other major producer of lithium in Chile (Sociedad Chilena del Litio Ltda., which was 100% owned by Rockwood Holdings Inc. of the United States) was not available, but it appears that Sociedad Chilena del Litio could have produced about 11,000 t of lithium carbonate in 2009 compared with about 18,000 t in 2008 (tables 1, 2; Rockwood Holdings Inc., 2010, p. 40, 47; Sociedad Química y Minera de Chile S.A., 2010, p. 5, 14, 25, 32, 42, 56, 66).

**Potash.**—In 2009, SQM increased production of potassium-based products at the Salar de Atacama, including

increasing production of KCl to about 886,000 t compared with about 700,000 t in 2008 and of potassium sulfate to about 189,000 t compared with about 163,000 t in 2008. The company estimated that global potash demand in 2009 was about 40% lower than that of 2008, but SQM was able to increase its sales of potash to 556,500 t of KCl compared with 185,600 t of KCl in 2008 by increasing its global market share. In 2010, the company expected global demand for potash to increase and to be able to further increase its potash production and sales. SQM expected to substantially increase production of KCl for sale as a separate product (as potash) in 2010 as well as to increase production of KCl for internal use as an input into the company's production of other products, such as potassium nitrate. By the end of 2009, SQM completed a project to increase production of mined potassium products in the Salar de Atacama, but SQM's production of potassium sulfate could decrease (to a greater or lesser extent) in 2010 depending on how much its dual-use plant in the Salar de Atacama is used to produce potassium chloride vs. potassium sulfate. SQM expected to use the plant to produce mostly KCl until 2012, and to produce both potassium chloride and potassium sulfate there after 2012. In 2009, it appeared as if Sociedad Chilena del Litio increased production of potash (KCl) slightly compared with that of 2008, but accurate data on annual potash production by this company were not available (tables 1, 2; Rockwood Holdings Inc., 2010, p. 40, 47; Servicio Nacional de Geología y Minería, 2010, p. 106-108; Sociedad Química y Minera de Chile S.A., 2010, p. 5, 14-18, 27-30, 32-33, 42, 48, 53, 55, 57, 66).

**Salt.**—Sociedad Minera Punta de Lobos (SPL) Ltda. (subsidiary of K+S AG) had a designed production capacity of 7 Mt/yr of salt (NaCl) and appeared to be by far the leading producer in Chile. In 2009, production of salt in Chile substantially exceeded SPL's listed production capacity, and it is assumed that this discrepancy was accounted for by production by the smaller scale producers in the country. Information concerning the annual production levels or production capacities of these smaller producers of salt was not available. In 2008, SPL extracted about 6.5 Mt of salt at its open pit mine in the Salar Grande de Tarapaca, but data on production of salt by the company in Chile in 2009 were not available (tables 1, 2; K+S Aktiengesellschaft, 2010, p. 62, 75, 144, 150; Servicio Nacional de Geología y Minería, 2010, p. 96).

### **Mineral Fuels**

**Coal.**—In 2009, production of coal in Region XII of Chile increased to about 518,000 t compared with about 321,000 t in 2008, apparently owing to increased production from existing coal mining operations in the Magallanes coal basin. Ingeniería del Sur S.A. expected to expand mining of the Pecket deposit in the Magallanes coal basin by constructing a new open pit mine (to be named the Tres Norte Mine) within the area of the Pecket deposit. If approved, construction of the new mine was tentatively scheduled to begin in March 2010, and the company expected that the Tres Norte Mine could produce between 600,000 t/yr and 1.2 Mt/yr of coal during an expected life of the mine of between 10 and 12 years (Portales, 2009, p. 4, 16, 18; Servicio Nacional de Geología y Minería, 2010, p. 133-134; 174-175).

Production of coal in Region VIII of the country decreased to about 118,000 t compared with about 212,000 t in 2008, and more-detailed information concerning where in the region this coal might have been produced was unavailable. ENACAR reported that it had closed the company's Trongol Mine in 2006 and that Carbonífera Victoria de Lebu S.A. (a wholly owned subsidiary of ENACAR) had closed La Fortuna de Lebu Mine in 2008, and company-level information about any other possible coal producers in this region of Chile during 2009 was not available. Other companies (which might have been only coal traders, as appeared to be the case with ENACAR) that were listed by SERNAGEOMIN as possibly producing coal in Region VIII during 2009 were Carbesor Carbon de Piedra Ltda., Carbomat Ltda., Carbonífera Cocker-Car Ltda., and Sociedad Contractual Minera Trinidad (Empresa Nacional del Carbón S.A., 2010, p. 1, 11-12; Servicio Nacional de Geología y Minería, 2010, p. 133-134; 164-165).

**Natural Gas and Petroleum.**—Although the LNG terminal at Quintero received its first commissioning shipment of LNG in July 2009, BG Group plc (40% owner) expected that the facility would not be ramped up to full storage, regasification, and distribution capacity until the third quarter of 2010. In 2009, GeoPark reportedly increased production of crude petroleum and natural gas compared with that of 2008, including production from new wells in the Springhill and the Tobifera oil and gas formations within the company's 100%-owned Fell Block in Chile. GeoPark claimed that its production accounted for approximately 50% of the total production of crude petroleum and 20% of natural gas production in Chile in 2009. All GeoPark's production of oil and condensate in the country was sold to ENAP (Chile's state-owned oil and gas company), and all GeoPark's production of natural gas appeared to have been channeled directly into Chile's main natural gas pipeline for the Magallanes region from the company's Kimiri Aike natural gas plant. In 2009, GeoPark also entered into a pre-sale funding arrangement with Methanex and agreed to begin paying Methanex back in the form of increased deliveries of natural gas to Methanex's methanol plant in Punta Arenas starting in September 2010 (BG Group plc, 2010, p. 20-21, 113; GeoPark Holdings Ltd., 2010, p. 2, 6, 8, 18-22, 33, 35, 42-43; Servicio Nacional de Geología y Minería, 2010, p. 14, 60).

### **Reserves and Resources**

The estimates of mineral reserves in Chile in table 3 include proven and probable reserves as of the end of 2008 and 2009 that were compiled (where possible) from company, Government, and other published sources. To obtain estimates of reserves and resources for 13 mineral commodities for the years 2002 through 2008, SERNAGEOMIN completed a survey of companies that had engaged in exploration for or production of those commodities in Chile. Using the information received, SERNAGEOMIN estimated reserves and resources of copper, gold, iodine, molybdenum, nitrates, and silver. Table 3 of this chapter includes SERNAGEOMIN's estimates of Chile's reserves of iodine, molybdenum, and nitrates at the end of 2008 only, since this was the latest year for which information on Chile's reserves of these minerals

was available from SERNAGEOMIN. Other Government sources for reserves estimates include the U.S. Energy Information Administration's Annual Energy Review (2010) and International Energy Statistics Database (undated). Estimates of gold and silver reserves include estimated gold and silver content of copper reserves using estimates of grams of gold and silver per metric ton of copper ore contained in some of the major copper porphyry deposits in Chile by Singer and others (2005) and more recently by the Metals Economics Group (2010). In addition, information from company reports was used extensively to revise reserves data for 2008 and (or) update reserves of boron, copper, gold, iron ore, potash, silver, and sulfate for 2009 (table 3; Servicio Nacional de Geología y Minería, 2010, p. 47-55).

In 2009, estimated mineral reserves in Chile appeared to be about the same or slightly higher than estimated reserves of most of the same minerals in the country in 2008, and only reserves of gold and sulfate were estimated to have increased significantly (by greater than 5%) during this timeframe. Estimated reserves of copper could have increased slightly (if at all) during this timeframe owing to increases in copper reserves just balancing or slightly exceeding depletion of reserves at the major copper mines in the country. By the end of 2009, the most notable increases in copper reserves in Chile compared with reported reserves at yearend 2008 appeared to be within CODELCO's Andina Division and at Los Bronces Mine, and the most notable decreases in copper reserves during this timeframe appeared to be in the total reserves at mines within the CODELCO Norte Division and at El Teniente Mine. Iron ore reserves (Fe content) controlled by CAP appeared to increase slightly compared with that of 2008 owing to an increase in iron ore reserves at the company's El Algarrobo Mine (table 3; CAP S.A., 2009, p. 21; 2010, p. 26; Corporación Nacional del Cobre, 2009a, p. 44; 2010a, p. 40; Anglo American plc, 2010, p. 152).

In 2009, estimated mineral gold reserves increased by 9.7% compared with that of 2008 mostly owing to the addition of about 173,000 kg of gold content from the Lobo Marte mining project of Kinross to the company's total proven and probable gold reserves in Chile compared with zero gold reserves reported for Lobo Marte at the end of 2008. In addition, mineral reserves of gold at Kinross's 50%-owned Cerro Casale project (Barrick owned the other 50% of Cerro Casale) increased by about 60,000 t; the gold content of reserves increased by smaller amounts at some other mines and mining projects (including at some copper mines and copper mining projects) in Chile during this timeframe. Estimated reserves of sulfate in the country increased by about 5.1% mostly owing to a reported increase in SQM's sulfate reserves contained in the mineral reserves that are controlled by the company in the Salar de Atacama (table 3; Kinross Gold Corp., 2009, p. 144; 2010, p. 145; Sociedad Química y Minera de Chile S.A., 2009, p. 43; 2010, p. 45; Barrick Gold Corp., 2010, p. 26, 30; Metals Economics Group, 2010).

## Outlook

In 2009, CODELCO continued construction work on the first phase of a project to expand production by 70,000 t/yr of copper at the Andina Mine, and this expansion was expected

to begin to contribute to the Andina Mine's production by sometime in 2010. The company also began the second phase of expansion at its Gabriela Mistral (Gaby) Mine, and CODELCO expected that this project would increase production capacity to 170,000 t/yr of copper by sometime after mid-2011 compared with 150,000 t/yr of copper at the Gaby Mine at the end of 2009. In 2009, the company also approved four major mining projects to be developed through the feasibility stage, including the company's proposed Ministro Hales Mine. If CODELCO were to approve construction of the Ministro Hales Mine by mid-2010, then the company expected that it could begin mining there by the end of 2013 and eventually produce about 170,000 t/yr of copper. CODELCO estimated that the deposit to be mined upon completion of construction of the Ministro Hales Mine contained about 9 grams per metric ton of silver, and the company expected that eventual production of silver from this mine could help make CODELCO one of the major producers of silver in the world. During 2010, the company also planned to conduct a feasibility study of converting the Chuquicamata Mine to an underground mining operation. Information concerning a definitive timeline for completion of the feasibility study or possible beginning of construction of the new underground mine was not available, but CODELCO did appear to expect that the current open pit operation at Chuquicamata would stop being profitable sometime before 2020. After the conversion to an underground operation, the company expected that Chuquicamata Mine could produce about 340,000 t/yr of copper and 18,000 t/yr of molybdenum. In 2009, CODELCO approved funds to conduct a study of the feasibility of a second phase of expansion of the Andina Mine, which CODELCO expected could eventually increase production capacity at Andina to 643,000 t/yr of copper (if completed), but no information on a possible timeline for completion of the feasibility study, approval of construction, or completion of construction for this proposed second phase of expansion of the Andina Mine was available. In July 2009, the company approved funds to conduct a study of the feasibility of constructing a new mine level at El Teniente Mine, and CODELCO expected that this project (if approved) could maintain the production capacity of El Teniente at 430,000 t/yr of copper and extend the mine life by 62 years, possibly starting in 2017 (Corporación Nacional del Cobre, 2010a, p. 47-50; Vidal, 2010, p. 8, 17-19).

During the global economic downturn, Anglo American continued a project to expand production capacity at the Los Bronces Mine in Chile, and the company still expected to complete construction of the project by yearend 2011 and to be able to attain a peak capacity of 490,000 t/yr of copper by the end of 2012 (although average production at Los Bronces Mine from 2013-23 was expected to be about 400,000 t/yr of copper). This increase in mine output at Los Bronces was expected also to involve increased annual production of the byproducts molybdenum and silver, but information on exact separate expected capacities for production of molybdenum and silver at Los Bronces Mine was not available. Antofagasta was expected to increase the copper production capacity at the company's 60%-owned Los Pelambres Mine to about 440,000 t/yr of copper contained in concentrates by mid-2010, and the

company expected to increase production at Los Pelambres to 407,000 t of copper and 9,500 t of molybdenum contained in concentrates in 2010 compared with about 312,000 t and 7,800 t, respectively, in 2009. Both gold and silver are contained in the copper concentrates produced at Los Pelambres Mine, but detailed information on (expected) levels of production of these byproducts there was not available. Antofagasta expected to complete construction of the company's 70%-owned Esperanza Mine by yearend 2010, and to ramp up production to average approximately 190,000 t/yr of copper, 6,700 kg/yr of gold, and some volume of silver (accounted for as a byproduct credit) contained in copper concentrates after 2011. Pan Pacific Copper Co., Ltd. of Japan was expected to construct the Caserones Mine and be able to begin production of about 150,000 t/yr of copper contained in concentrates, 3,000 t/yr of molybdenum contained in concentrates, and 30,000 t/yr of copper cathodes there by sometime in 2014 (Anglo American plc, 2010, p. 15, 20-21, 42-45; Antofagasta plc, 2010, p. 5-6, 17-19, 24-25; Pan Pacific Copper Co., Ltd., 2010; Vidal, 2010, p. 19-25).

Uncertainty (owing to labor negotiations, changing tax regimes, uncertainty in possible output prices, or even to some accidents or incidents, such as the fire in 2009 at the Nos Plant of MOLYMET) is ever present and could affect many of the above-projected timelines for mining projects or companies' production plans at existing mineral production facilities. Especially for new mining projects that do not yet have a completed feasibility study or do not expect to begin production until 4 to 5 years after an announced timeline, uncertainty can lead to delays in the actual start of production until years after the initially announced startup date. For 2010, it has been estimated that production of copper in Chile could increase to about 5.45 Mt; lithium carbonate, to 40,000 t; molybdenum, to 36,000 t; potash, to about 800,000 t (K<sub>2</sub>O equivalent); and production of cement could decrease to an estimated 3.7 Mt; mined gold, to 39 t; iodine, to 15,000 t; pumicite, to 910,000 t; rhenium, to 20,000 t; and silver, to 1,200 t compared with volumes of production of these minerals in the country in 2009. After 2010, Chile's production of mined copper, lithium, molybdenum, and potash could increase a bit more if global demand for these commodities continues to increase, because it appears that there could still be some excess capacity for production of these minerals even after some increases in production take place in 2010. Production of cement and pumicite could also increase in 2011 if Chile's domestic construction sector increases demand for minerals primarily used in construction, because demand for cement by the Chilean construction sector in 2010 was expected to decrease by about 5% compared with that of 2009. In 2011, production of mined gold and silver could increase if some new projects (including predominantly copper mining projects) enter into production or ramp up production at projects that may start up near the end of 2010. In 2011, production of iodine could increase compared with that of 2010 if producing companies reduce apparent yearend 2009 inventories sufficiently during 2010. In 2011 (or even in 2010), production of rhenium could be significantly higher than the above estimate for 2010 if the 2009 fire at MOLYMET's Nos plant does not have a significant or prolonged effect on production of rhenium metal or chemicals at that plant.

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TABLE 1  
CHILE: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

| Commodity <sup>2</sup>                          | 2005    | 2006               | 2007    | 2008               | 2009               |
|---|---------|--------------------|---------|--------------------|--------------------|
| <b>METALS</b>                                   |         |                    |         |                    |                    |
| Arsenic trioxide <sup>e,3</sup>                 | 11,000  | 11,000             | 11,000  | 10,000             | 11,000             |
| Copper:   |         |                    |         |                    |                    |
| Mine output, Cu content <sup>4</sup>            | 5,321   | 5,361              | 5,557   | 5,328 <sup>r</sup> | 5,390              |
| Metal:  |         |                    |         |                    |                    |
| Smelter, primary                                | 1,558   | 1,565              | 1,514   | 1,369              | 1,522              |
| Refined:  |         |                    |         |                    |                    |
| Electrowon                                      | 1,585   | 1,692              | 1,832   | 1,971 <sup>r</sup> | 2,113              |
| Primary, other                                  | 1,239   | 1,119              | 1,105   | 1,087 <sup>r</sup> | 1,159              |
| Total   | 2,824   | 2,811              | 2,937   | 3,058 <sup>r</sup> | 3,272              |
| Gold, mine output, Au content                   | 40,447  | 42,100             | 41,527  | 39,162             | 40,834             |
| Iron and steel:                                 |         |                    |         |                    |                    |
| Ore and concentrate:                            |         |                    |         |                    |                    |
| Gross weight                                    | 7,862   | 8,628 <sup>r</sup> | 8,818   | 9,316              | 8,242              |
| Fe content                                      | 4,707   | 5,235              | 5,379   | 5,670              | 5,006              |
| Metal:  |         |                    |         |                    |                    |
| Pig iron  | 1,074   | 1,115              | 1,147   | 1,150              | 920 <sup>e</sup>   |
| Ferroalloys: <sup>e,5</sup>                     |         |                    |         |                    |                    |
| Ferrocromium                                    | 131     | 84                 | 193     | 54                 | 11                 |
| Ferromolybdenum                                 | 9,250   | 14,000             | 14,800  | 16,900             | 10,800             |
| Steel, crude                                    | 1,537   | 1,627              | 1,679   | 1,523 <sup>r</sup> | 1,302              |
| Semimanufactures                                | 1,293   | 1,520              | 1,607   | 1,573 <sup>r</sup> | 1,300 <sup>e</sup> |
| Lead, mine output, Pb content                   | 878     | 672                | 1,305   | 3,985              | 1,511              |
| Manganese ore and concentrate:                  |         |                    |         |                    |                    |
| Gross weight                                    | 39,786  | 37,169             | 26,808  | 18,273             | 5,722              |
| Mn content                                      | 12,324  | 9,771              | 7,287   | 5,096              | 1,642              |
| Molybdenum, mine output, Mo content             | 48,041  | 43,278             | 44,912  | 33,687             | 34,925             |
| Of which, oxides <sup>6</sup>                   | 8,971   | 7,197              | 7,244   | 5,662              | 7,134              |
| Rhenium, mine output, Re content <sup>e,7</sup> | 21,500  | 19,800             | 22,900  | 27,600             | 25,000             |
| Selenium <sup>c</sup>                           | 84,000  | 74,000             | 70,000  | 78,000             | 90,000             |
| Silver:   |         |                    |         |                    |                    |
| Mine output, Ag content                         | 1,400   | 1,607              | 1,936   | 1,405              | 1,301              |
| Metal, Ag content <sup>8</sup>                  | 171,445 | 150,952            | 141,071 | 161,992            | 195,375            |
| Zinc, mine output, Zn content                   | 28,841  | 36,238             | 36,453  | 40,519             | 27,801             |
| <b>INDUSTRIAL MINERALS</b>                      |         |                    |         |                    |                    |
| Barite  | 91      | 375                | 77      | --                 | --                 |
| Boron compounds:                                |         |                    |         |                    |                    |
| Boric acid (H <sub>3</sub> BO <sub>3</sub> )    | 8,774   | 8,446              | 7,143   | 7,525              | 5,214              |
| Ulexite, natural                                | 460,683 | 459,645            | 527,929 | 583,474            | 607,921            |
| Total   | 469,457 | 468,091            | 535,072 | 590,999            | 613,135            |
| Cement, hydraulic                               | 3,999   | 4,112              | 4,440   | 4,622              | 3,876              |
| Clays:  |         |                    |         |                    |                    |
| Bentonite                                       | --      | --                 | 533     | --                 | --                 |
| Kaolin  | 15,183  | 44,642             | 87,901  | 63,526             | 48,354             |
| Refractory <sup>9</sup>                         | 35,271  | 34,594             | 24,434  | 60,022             | 69,634             |
| Other, including ball and plastic clays         | 54,301  | 84,846             | 97,189  | 23,197             | 6,076              |
| Total   | 104,755 | 164,082            | 210,057 | 146,745            | 124,064            |
| Copper sulfate                                  | 9,659   | 5,124              | 10,217  | 12,971             | 11,860             |
| Diatomite                                       | 16,418  | 19,104             | 25,405  | 25,497             | 23,027             |
| Dolomite  | 24,903  | 24,006             | 13,791  | 14,263             | --                 |
| Feldspar  | 5,820   | 5,847              | 6,704   | 17,834             | 9,079              |

See footnotes at end of table.

TABLE 1—Continued  
CHILE: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

| Commodity <sup>2</sup>                                | 2005                       | 2006                | 2007                | 2008                | 2009                |         |
|---|----------------------------|---------------------|---------------------|---------------------|---------------------|---------|
| INDUSTRIAL MINERALS—Continued                         |                            |                     |                     |                     |                     |         |
| Gypsum:   |                            |                     |                     |                     |                     |         |
| Crude   | thousand metric tons       | 661                 | 845                 | 773                 | 774                 | 724     |
| Calcined  | do.                        | 310                 | 197                 | 200                 | 197                 | 196     |
| Iodine, elemental                                     |                            | 15,346              | 16,494              | 15,473              | 15,503              | 17,399  |
| Lime, hydraulic <sup>e</sup>                          | thousand metric tons       | 800 <sup>r</sup>    | 820 <sup>r</sup>    | 840 <sup>r</sup>    | 820 <sup>r</sup>    | 790     |
| Lithium compounds, natural:                           |                            |                     |                     |                     |                     |         |
| Lithium carbonate                                     |                            | 43,091 <sup>r</sup> | 46,241 <sup>r</sup> | 51,292 <sup>r</sup> | 48,469 <sup>r</sup> | 25,154  |
| Lithium chloride                                      |                            | 681                 | 1,166               | 4,185               | 4,362               | 2,397   |
| Lithium hydroxide                                     |                            | 504                 | 3,794               | 4,160               | 4,050               | 2,987   |
| Nitrates, crude, natural                              | thousand metric tons       | 1,283               | 1,112               | 1,160               | 1,158               | 1,049   |
| Phosphatic materials, natural:                        |                            |                     |                     |                     |                     |         |
| Phosphate rock (apatite):                             |                            |                     |                     |                     |                     |         |
| Gross weight  |                            | 10,311              | 12,236              | 12,910              | 21,306              | 10,584  |
| P <sub>2</sub> O <sub>5</sub> content <sup>e</sup>    |                            | 3,178 <sup>10</sup> | 3,770               | 3,980               | 6,570 <sup>r</sup>  | 3,260   |
| Phosphorite   |                            | 10,052              | 1,600               | 12,163              | 16,988              | 1,059   |
| Guano   |                            | --                  | --                  | --                  | 2,892               | 1,649   |
| Potash, natural:                                      |                            |                     |                     |                     |                     |         |
| Potassium chloride, KCl                               |                            | 733,814             | 647,449             | 690,692             | 753,995             | 942,309 |
| Of which, K <sub>2</sub> O equivalent <sup>11</sup>   |                            | 463,600             | 409,000             | 436,300             | 476,300             | 595,300 |
| Potassium sulfate, K <sub>2</sub> SO <sub>4</sub>     |                            | 162,102             | 170,406             | 155,853             | 163,096             | 188,643 |
| Of which, K <sub>2</sub> O equivalent <sup>e,12</sup> |                            | 83,000              | 87,000              | 79,000              | 83,000              | 96,000  |
| Pumicite  | thousand metric tons       | 1,620               | 1,423               | 1,136               | 1,063               | 919     |
| Pyrophyllite  |                            | 3,315               | 1,257               | 1,340               | 1,147               | 412     |
| Salt (NaCl)   | thousand metric tons       | 6,068               | 4,580               | 4,404               | 6,431               | 8,382   |
| Siliceous sand and gravel (silica):                   |                            |                     |                     |                     |                     |         |
| Quartz, unspecified                                   | do.                        | 589                 | 444                 | 520                 | 536                 | 601     |
| Silica sand   | do.                        | 562                 | 638                 | 713                 | 865                 | 803     |
| Total   | do.                        | 1,151               | 1,081               | 1,234               | 1,401               | 1,405   |
| Sodium compounds, n.e.s., sulfate <sup>13, 14</sup>   |                            | 15,730              | 100 <sup>e</sup>    | 100 <sup>e</sup>    | 128                 | 112     |
| Stone:  |                            |                     |                     |                     |                     |         |
| Limestone, calcium carbonate                          | thousand metric tons       | 6,783               | 7,145               | 7,196               | 7,295               | 6,012   |
| Of which:   |                            |                     |                     |                     |                     |         |
| Coquina   | do.                        | 215                 | 330                 | 392                 | 420                 | 297     |
| Ground calcium carbonate, white                       | do.                        | 41                  | 16                  | 15                  | 34                  | 46      |
| Lapis lazuli  |                            | 130                 | 400                 | 72                  | 5                   | 215     |
| Marble  |                            | 31                  | 169                 | 204                 | 187                 | 1,582   |
| Travertine  |                            | 4,680               | 12,020              | 14,805              | 11,413              | 5,473   |
| Sulfur, byproduct <sup>15</sup>                       | thousand metric tons       | 1,635               | 1,641               | 1,569               | 1,573               | 1,627   |
| Talc  |                            | 886                 | 704                 | 764                 | 961                 | 790     |
| Zeolites  |                            | 298                 | 280                 | 140                 | --                  | --      |
| MINERAL FUELS AND RELATED MATERIALS                   |                            |                     |                     |                     |                     |         |
| Coal, bituminous and lignite, marketable              | thousand metric tons       | 732                 | 674                 | 288                 | 534                 | 636     |
| Coke, coke oven <sup>c</sup>                          | do.                        | 530                 | 560                 | 580 <sup>r</sup>    | 520 <sup>r</sup>    | 450     |
| Methanol  | do.                        | 3,029               | 3,186               | 1,841               | 1,088               | 942     |
| Natural gas liquids: <sup>e</sup>                     |                            |                     |                     |                     |                     |         |
| Natural gasoline                                      | thousand 42-gallon barrels | 1,000               | 1,000               | 1,000               | 1,000               | 1,000   |
| Liquefied natural gas                                 | do.                        | 2,500               | 2,500               | 2,500               | 2,500               | 2,500   |
| Total   | do.                        | 3,500               | 3,500               | 3,500               | 3,500               | 3,500   |
| Natural gas, marketable                               | million cubic meters       | 2,294               | 2,199               | 2,015               | 1,828               | 1,889   |

See footnotes at end of table.

TABLE 1—Continued  
CHILE: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

| Commodity <sup>2</sup>  | 2005   | 2006   | 2007   | 2008   | 2009   |
|---|--------|--------|--------|--------|--------|
| MINERAL FUELS AND RELATED MATERIALS—Continued                                     |        |        |        |        |        |
| Petroleum:  |        |        |        |        |        |
| Crude and condensate <sup>16</sup>  | 1,208  | 1,061  | 931    | 966    | 1,355  |
| thousand 42-gallon barrels  |        |        |        |        |        |
| Refinery products: <sup>17</sup>  |        |        |        |        |        |
| Liquefied petroleum gas   | 7,101  | 8,623  | 8,246  | 7,674  | 8,560  |
| do.   |        |        |        |        |        |
| Gasoline, including for aviation  | 19,767 | 21,668 | 18,725 | 21,687 | 21,121 |
| do.   |        |        |        |        |        |
| Kerosene, including for jet fuel  | 5,564  | 5,548  | 4,862  | 4,573  | 5,271  |
| do.   |        |        |        |        |        |
| Diesel and distillate fuel oil  | 26,282 | 25,600 | 24,040 | 27,549 | 25,751 |
| do.   |        |        |        |        |        |
| Residual fuel oil   | 15,421 | 17,523 | 16,310 | 12,756 | 11,177 |
| do.   |        |        |        |        |        |
| Other, including asphalt, ethylene, naphtha,<br>propylene, solvents, and so forth | 1,744  | 9,108  | 10,032 | 8,334  | 7,875  |
| do.   |        |        |        |        |        |
| Total   | 75,879 | 88,070 | 82,215 | 82,573 | 79,755 |

<sup>8</sup>Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. <sup>1</sup>Revised. do. Ditto. -- Zero.

<sup>1</sup>Table includes data available through December 6, 2010.

<sup>2</sup>In addition to the commodities listed, pyrite is also produced, but available information is inadequate to make reliable estimates of output.

<sup>3</sup>Estimated arsenic trioxide equivalent of possible arsenic-containing residues and smelter dusts that might be recovered from nonferrous metals plants in Chile, although these residual materials may not have been processed to recover commercial-grade arsenic trioxide.

<sup>4</sup>Figures are the nonduplicate copper content of ore concentrates, blister, and refined copper measured at the last stage of commercial production, as reported by Comisión Chilena del Cobre (COCHILCO). Mine production reported by Servicio Nacional de Geología y Minería (SERNAGEOMIN) for the same years was only slightly higher (0.01% to 0.95%).

<sup>5</sup>Estimated from reported exports.

<sup>6</sup>Production of molybdenum oxide only from the CODELCO Norte Division of Corporación Nacional del Cobre de Chile (CODELCO).

<sup>7</sup>Rhenium content of mine output in Chile was estimated based on information from COCHILCO.

<sup>8</sup>Production of refined silver metal (granular) only from the Ventanas smelter and refinery.

<sup>9</sup>Figures included as part of kaolin or other clays production in USGS Minerals Yearbook chapters prior to 2006.

<sup>10</sup>Reported figure.

<sup>11</sup>Based on 63.17% potassium oxide equivalent for potassium chloride (sylvite) in Chile, as reported by SERNAGEOMIN, and rounded to four significant digits.

<sup>12</sup>Based on an assumed 51% potassium oxide equivalent for potassium sulfate, according to a minimum global average estimate and rounded to two significant digits. Source: Jasinski, S.M., 2010, Potash, in *Metals and minerals: U.S. Geological Survey Minerals Yearbook 2008*, v. I, p. 58.1-58.9.

<sup>13</sup>Not elsewhere specified.

<sup>14</sup>Includes production of natural sodium sulfate and anhydrous sodium sulfate, which are coproducts of the nitrate industry (salitre).

<sup>15</sup>Sulfur content of sulfuric acid as a byproduct of metallurgy and processing of mineral fuels, as reported by COCHILCO.

<sup>16</sup>Includes natural gasoline.

<sup>17</sup>Includes production from both imported and domestic petroleum, as reported by SERNAGEOMIN before 2006 and by Empresa Nacional del Petróleo (ENAP) for 2006, 2007, 2008, and 2009.



TABLE 2  
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2009

(Thousand metric tons unless otherwise specified)

| Commodity   | Major operating companies and major equity owners   | Location of main facilities  | Annual capacity <sup>c</sup> |
|---|---|--|------------------------------|
| Barite<br>metric tons                                     | Sociedad Minera Godoy Schwenger y Cia.  | La Calera, Region V  | 400                          |
| Bentonite<br>do.  | Sociedad Legal Minera Mabel Dos Primera de Arica  | Quarry and plant near Arica, Region XV   | 1,500                        |
| Boron compounds,<br>B <sub>2</sub> O <sub>3</sub> content | Química Industrial del Bórax Ltda.<br>(private, Chile-based investors, 100%)  | Ulexite mine at Salar del Surire; and boric acid and agrochemical plants near Arica, Region XV   | 550                          |
| Do.   | S.Q.M. Boratos S.C.M. [Sociedad Química y Minera de Chile S.A. (SQM), 100%]   | Mine brines of Atacama Salar, and boric acid plant at Antofagasta, Region II   | 200                          |
| Do.   | S.Q.M. Salar S.A. [Sociedad Química y Minera de Chile S.A. (SQM), 100%]   | Plant in Santiago Metropolitan Region  | NA                           |
| Calcium carbonate, natural                                | Minera El Way S.A. (Cementos Bio Bio S.A., 100%)  | Quarry near Antofagasta, Region II   | NA                           |
| Do.   | Minera El Jilguero S.A. (Cementos Bio Bio S.A., 100%)   | Quarry near Copiapo, Region III  | NA                           |
| Do.   | Minera Río Teno S.A. (Cementos Bio Bio S.A., 100%)  | Quarry and plant at Teno, near Curico, Region VII  | NA                           |
| Do.   | Minera Río Colorado S.A. (Cementos Bio Bio S.A., 51%, and Soproc Calerías e Industrias S.A., 49%)                                   | La Perla Mine and plant near Melipilla, Santiago Metropolitan Region   | NA                           |
| Do.   | Sociedad Minera Las Abuelitas Ltda.<br>(Soproc Calerías e Industrias S.A., 100%)  | Mine and plant near Melipilla, Santiago Metropolitan Region  | NA                           |
| Do.   | Minera Melón S.A. (Melón S.A., 100%)  | Navío Mine near Quillota, Region V   | NA                           |
| Do.   | Alfredo Villalobos Román Tarsicio S.A.  | Quarry and plant near Illapel, Region IV   | NA                           |
| Do.   | César B. Formas Ortiz S.A.  | Plant at Chañaral, Region III  | NA                           |
| Do.   | Explotaciones de Minas Tongoy Ltda.   | Quarry and plant near Tongoy, Region IV  | NA                           |
| Do.   | Imopac Ltda.  | Plant at Vallenar, Region III  | NA                           |
| Do.   | Mario Alberto Pizarro A. S.A.   | Plant at Los Vilos, Region IV  | NA                           |
| Do.   | Minera Trucco Ltda.   | Mine and plant, Santiago Metropolitan Region   | NA                           |
| Do.   | Cristalerías Toro S.A.I.C.  | Plant at Santiago, Santiago Metropolitan Region  | NA                           |
| Do.   | Sociedad Minera Godoy Schwenger y Cia.  | Mine and plant near Quillota, Region V   | NA                           |
| Do.   | Compañía Minera Feltre Ltda.  | Plant at Santiago, Santiago Metropolitan Region  | NA                           |
| Do.   | Compañía Minera Saturno Ltda.   | do.  | NA                           |
| Do.   | Unimin Chile Ltda.  | do.  | NA                           |
| Do.   | Sociedad Minera y Comercial Alegría y Cia Ltda.   | Mine and plant at Coquimbo, Region IV  | NA                           |
| Do.   | Sociedad Contractual Minera Pirineos  | Quarry and plant at Vallenar, Region III   | NA                           |
| Do.   | Cemento Polpaico S.A. (Holcim Ltd., 54.3%; Compañía de Consumidores de Gas de Santiago, 40.9%; other, 4.8%)                         | Cerro Blanco plant, Santiago Metropolitan Region; Mejillones plant, Region II; Coronel plant, Region VIII  | NA                           |
| Cement  | do.   | do.  | 2,500 <sup>1</sup>           |
| Do.   | Melón S.A. (Inversiones Brescia S.A., 99.24%, and other private, 0.76%)   | La Calera plant, Region V, and grinding plant at Puerto Montt, Region X  | 1,800 <sup>1</sup>           |
| Do.   | Cementos Bio Bio S.A. (private, 100%)   | Talcahuano Plant, Region VIII  | 750 <sup>1</sup>             |
| Do.   | do.   | Grinding plant at San Antonio, Region V  | 300 <sup>1</sup>             |
| Do.   | Industria Nacional de Cemento S.A. (INACESA), 100%  | Plant near Antofagasta City, Region II   | 500 <sup>1</sup>             |
| Do.   | do.   | Plant near Curico City, Region VII   | 1,700 <sup>1</sup>           |
| Clays, unspecified  | Sociedad Minera Casablanca S.A.   | Quarry and plant in Santiago Metropolitan Region   | NA                           |
| Do.   | Sociedad Minera Godoy Schwenger y Cia.  | Quarry and plant near Quillota, Region V   | NA                           |
| Do.   | Minera Lealtad Ltda.  | Quarry and plant at Til Til, Santiago Metropolitan Region, and at Olmue, Region V  | NA                           |
| Coal, bituminous and lignite                              | Empresa Nacional del Carbón S.A. (ENACAR)   | Trongol Mine near Curanilahue, and plant at Lota, Region VIII  | NA                           |
| Do.   | Carbonífera Victoria de Lebu S.A.<br>(Empresa Nacional del Carbón S.A., 100%)   | La Fortuna de Lebu Mine near Lebu, Region VIII   | 150                          |
| Do.   | Ingeniería del Sur S.A.   | Bish Mine and possibly other active mines, Pecket deposit, Magallanes coal basin, Region XII   | 600                          |
| Copper, Cu content  | Minera Escondida Ltda. (BHP Billiton plc, 57.5%; Rio Tinto plc, 30%; Japan Escondida Corp., 10%; International Finance Corp., 2.5%) | Escondida open pit mine, two concentrator plants, an oxide plant for cathode production (SX-EW <sup>2</sup> ), and a sulfide-leach plant for cathode production, Region II | 1,300 <sup>1</sup>           |
| Do.   | Minera Spence S.A. (BHP Billiton plc, 100%)   | Spence Mine and SX-EW <sup>2</sup> plant, Region II  | 200 <sup>1</sup>             |
| Do.   | Compañía Minera Cerro Colorado<br>(BHP Billiton plc, 100%)  | Cerro Colorado Mine and SX-EW <sup>2</sup> plant, Region I   | 100 <sup>1</sup>             |

See footnotes at end of table.

TABLE 2—Continued  
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2009

(Thousand metric tons unless otherwise specified)

| Commodity                        | Major operating companies and major equity owners   | Location of main facilities   | Annual capacity <sup>e</sup> |
|----------------------------------|---|---|------------------------------|
| Copper, Cu content—<br>Continued | Compañía Minera Doña Inés de Collahuasi SCM<br>(Anglo American plc, 44%; Xstrata plc, 44%;<br>companies led by Mitsui & Co. Ltd., 12%)                            | Collahuasi open pit mine, concentration plant, and<br>SX-EW <sup>2</sup> plant, at Ujina, Region I  | 590 <sup>1</sup>             |
| Do.                              | Corporación Nacional del Cobre (CODELCO)<br>(Government, 100%)  | CODELCO Norte Division, including Chuquicamata, Mina<br>Mina Sur, and Radomiro Tomic Mines; and<br>Chuquicamata SX-EW <sup>2</sup> plant (oxide), smelter,<br>and refinery (oxide and sulfide), and<br>Radomiro Tomic SX-EW <sup>2</sup> plant, Region II | 900                          |
| Do.                              | do.   | El Teniente Division and Mine, and Caletones smelter<br>(anodes) and refinery (fire-refined ingots), Region VI  | 430                          |
| Do.                              | do.   | Ventanas Division, Las Ventanas smelter and refinery<br>(cathodes), Region V  | 400                          |
| Do.                              | do.   | Andina Division, including Rio Blanco and Sur Sur Mines<br>(concentrates), Region V   | 210                          |
| Do.                              | do.   | Salvador Division, including Campamento Antiguo and<br>Damiana Norte open pit mines; Inca underground mine;<br>and Potrerillos SX-EW <sup>2</sup> plant and refinery, Region III  | 80                           |
| Do.                              | Minera Gaby S.A. [Corporación Nacional del Cobre<br>(CODELCO) (Government, 100%), 100%]   | Gabriela Mistral Mine and SX-EW <sup>2</sup> plant, Sierra Gorda,<br>Region II  | 150 <sup>1</sup>             |
| Do.                              | Compañía Minera Los Pelambres S.A.<br>(Antofagasta plc, 60%, and a Japanese consortia, 40%)   | Los Pelambres open pit mine and concentration plant,<br>Region IV   | 340                          |
| Do.                              | Minera El Tesoro S.A. (Antofagasta plc, 100%)   | El Tesoro open pit mine and SX-EW <sup>2</sup> plant, Region II   | 100                          |
| Do.                              | Minera Michilla S.A. (Antofagasta plc, 74.2%, and other<br>private Chilean investors, 25.8%)  | Michilla Mine and SX-EW <sup>2</sup> /sulfide-leaching plant,<br>Region II  | 45                           |
| Do.                              | Empresa Nacional de Minería (ENAMI)<br>(Government, 100%)   | Hernán Videla Lira smelter (anodes and blister),<br>Paipote, Region III   | 340                          |
| Do.                              | do.   | Concentration plants: Manuel Antonio Matta, Paipote;<br>Osvaldo Martínez, El Salado; and Vallenar, Region III;<br>and José Antonio Moreno, Taltal, Region II  | 180                          |
| Do.                              | Anglo American Sur S.A. (Anglo American plc, 100%)  | Los Bronces Mine (concentrates) and Tortolas SX-EW <sup>2</sup><br>plant (cathodes), Santiago Metropolitan Region   | 250                          |
| Do.                              | do.   | Chagres smelter (anodes and blister), Region V  | 175                          |
| Do.                              | do.   | El Soldado Mine (concentrates), Region V  | 50                           |
| Do.                              | Empresa Minera de Mantos Blancos S.A. (Anglo<br>American plc, 99.9%, and other private, 0.1%)   | Mantos Blancos open pit mine and SX-EW <sup>2</sup> plant,<br>Region II   | 100                          |
| Do.                              | do.   | Mantoverde open pit mine and SX-EW <sup>2</sup> plant, Region III   | 65                           |
| Do.                              | Xstrata Copper Chile S.A.   | Altonorte smelter (anodes and blister), La Negra, Region II   | 280 <sup>1</sup>             |
| Do.                              | Compañía Minera Xstrata Lomas Bayas<br>(Xstrata plc, 100%)  | Lomas Bayas Mine and SX-EW <sup>2</sup> plant, Region II  | 75 <sup>1</sup>              |
| Do.                              | Sociedad Contractual Minera El Abra<br>[Freeport-McMoRan Copper & Gold Inc., 51%, and<br>Corporación Nacional del Cobre (CODELCO)<br>(Government, 100%), 49%]     | El Abra Mine and SX-EW <sup>2</sup> plant, near Calama,<br>Region II  | 225 <sup>1</sup>             |
| Do.                              | Cía. Contractual Minera Candelaria<br>(Freeport-McMoRan Copper & Gold Inc., 80%,<br>and SMMA Candelaria Inc., 20%)  | Candelaria open pit mine, underground mine, and<br>concentration plant, near Copiapo, Region III  | 150                          |
| Do.                              | Cía. Contractual Minera Ojos del Salado<br>(Freeport-McMoRan Copper & Gold Inc., 80%,<br>and SMMA Candelaria Inc., 20%)   | Ojos del Salado Mine and concentration plant, near<br>Copiapo, Region III   | 35                           |
| Do.                              | Compañía Minera Zaldívar (Barrick Gold Corp., 100%)   | Zaldívar open pit mine and SX-EW <sup>2</sup> plant, Region II  | 150                          |
| Do.                              | Compañía Minera Quebrada Blanca<br>[Teck Cominco Ltd., 76.5%; Inversiones Mineras S.A.,<br>13.5%; Empresa Nacional de Minería (ENAMI)<br>(Government, 100%), 10%] | Quebrada Blanca open pit mine and SX-EW <sup>2</sup> plant,<br>Region I   | 100                          |

See footnotes at end of table.

TABLE 2—Continued  
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2009

(Thousand metric tons unless otherwise specified)

| Commodity                        |             | Major operating companies and major equity owners  | Location of main facilities  | Annual capacity <sup>e</sup> |
|----------------------------------|-------------|--|--|------------------------------|
| Copper, Cu content—<br>Continued |             | Compañía Minera Carmen de Andacollo<br>[Teck Cominco Ltd., 90%, and Empresa Nacional de Minería (ENAMI) (Government, 100%), 10%] | Carmen de Andacollo Mine and SX-EW <sup>2</sup> plant, Region IV   | 22                           |
| Do.                              |             | Alliance Copper Ltd. (Codelco Technologies Ltd., 100%)   | Plant to acid-leach fine copper at Chuquicamata, Region II (from residual material produced at CODELCO Norte and El Teniente Divisions)                  | 20                           |
| Copper sulfate                   | metric tons | Compañía Minera Cerro Negro  | Portales Mine and a plant at Cabildo, Region V   | 200                          |
| Do.                              | do.         | Minera Capacho Viejo Ltda.   | Mine and plant near Tocopilla, Region II   | 5,000                        |
| Do.                              | do.         | Compañía Minera San Gerónimo   | Mine and plant near Coquimbo, Region IV  | 10,000                       |
| Diatomite                        |             | Celite Chile Ltda. (IMERYS S.A., 100%)   | Plant at Port of Arica, and mining operations nearby in Regions I and XV   | 30                           |
| Dolomite                         |             | Minera El Jilguero S.A. (Cementos Bío Bío S.A., 100%)  | Quarries and plant near Copiapo, Region III <sup>3</sup>   | 30                           |
| Feldspar                         |             | Minera Alfa Quintay Ltda.  | Quarry and plant, Santiago Metropolitan Region   | NA                           |
| Do.                              |             | J.B. Schiappacase A.   | Quarry and plant near Limache, Region V  | NA                           |
| Do.                              |             | Minera Pacífico Ltda.  | Quarries and plants in Region VI, and plant in Santiago Metropolitan Region  | NA                           |
| Ferromolybdenum                  |             | Molibdenos y Metales S.A. (MOLYMET)<br>(private, 100%)   | Nos plant, San Bernardo, 30 kilometers south of Santiago, Santiago Metropolitan Region   | 25                           |
| <b>Gold:</b>                     |             |  |  |                              |
| Metal ingots                     | kilograms   | Corporación Nacional del Cobre (CODELCO)<br>(Government, 100%)   | Ventanas refinery, Region V  | 6,000                        |
| Mine output                      | do.         | do.  | Andina, CODELCO Norte, El Teniente, and Salvador Divisions (byproduct of copper production)  | 2,000                        |
| Do.                              | do.         | Minera Escondida Ltda., 100%   | Escondida copper mine and plants, Region II  | 4,500                        |
| Do.                              | do.         | Cía. Contractual Minera Candelaria, 100%   | Candelaria copper mine and plant, Region III   | 2,500                        |
| Do.                              | do.         | Cía. Contractual Minera Ojos del Salado, 100%  | Ojos del Salado copper mine and plant, Region III  | 600                          |
| Do.                              | do.         | Compañía Minera Los Pelambres S.A., 100%   | Los Pelambres Mine and plant, Region IV  | 1,200                        |
| Do.                              | do.         | Empresa Nacional de Minería (ENAMI)<br>(Government, 100%)  | Manuel Antonio Matta plant, Paipote; Osvaldo Martínez plant, El Salado; and Vallenar plant, Region III; and José Antonio Moreno plant, Taltal, Region II | 400                          |
| Do.                              | do.         | Compañía Minera Doña Inés de Collahuasi SCM, 100%  | Collahuasi Mine and plants, Region I   | NA                           |
| Do.                              | do.         | Compañía Minera Mantos de Oro<br>(Kinross Gold Corp., 100%)  | La Coipa Mine and plant, Region III,<br>140 kilometers north of Copiapo  | 7,400                        |
| Do.                              | do.         | Compañía Minera Maricunga<br>(Kinross Gold Corp., 100%)  | Maricunga open pit, heap-leach mine, Region III,<br>100 kilometers east of Copiapo   | 7,500                        |
| Do.                              | do.         | Cía. Minera Meridian S.A. (Yamana Gold Inc., 100%)   | El Peñón Mine and concentration plant, Region II   | 7,000                        |
| Do.                              | do.         | Minera Florida S.A. (Yamana Gold Inc., 100%)   | Minera Florida Mine and concentration plant,<br>Santiago Metropolitan Region   | 2,700                        |
| Do.                              | do.         | Compañía Minera Cerro Bayo Ltda.<br>(Coeur d'Alene Mines Corp., 100%)  | Cerro Bayo Mine and concentration plant, <sup>3</sup> Region XI  | 1,000                        |
| Do.                              | do.         | Sociedad Contractual Minera El Toqui Ltda.<br>(Breakwater Resources Ltd., 100%)  | El Toqui Mine and Doña Rosa concentration plant,<br>Region XI, 120 kilometers north of Coyhaique   | 1,500                        |
| Gypsum, natural                  |             | Compañía Industrial El Volcán S.A. (Saint-Gobain Gypsum S.A., 100%)  | El Volcan quarry near Santiago, Santiago Metropolitan Region   | 100                          |
| Do.                              |             | Compañía Minera Romeral S.A. (Etex Group S.A., 59.8%, and Melón S.A., 40.2%)   | El Romeral quarry near Santiago, Santiago Metropolitan Region  | 50                           |
| Do.                              |             | Minera Lo Valdés Ltda.   | Santiago Metropolitan Region   | NA                           |
| Do.                              |             | Compañía Minera Polpaico Ltda.   | Yeso Norte Mine, Region II   | NA                           |
| Do.                              |             | Industria Nacional de Cemento S.A. (INACESA), 100%   | Mantos verdes quarry near Antofagasta City, Region II  | NA                           |
| Do.                              |             | Antonio Zotti Rosetti y Cía. Sociedad Minera   | La Confianza and San Jose Mines near Los Vilos, Region IV; Margarita and San Nicolas Mines, and a plant near Renca, Santiago Metropolitan Region         | NA                           |

See footnotes at end of table.

TABLE 2—Continued  
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2009

(Thousand metric tons unless otherwise specified)

| Commodity                    |             | Major operating companies and major equity owners  | Location of main facilities   | Annual capacity <sup>e</sup> |
|------------------------------|-------------|--|---|------------------------------|
| Iodine                       | metric tons | SQM Químicos S.A. [Sociedad Química y Minera de Chile S.A. (SQM), 100%]                                | Nueva Victoria Mine and plant and Iris Plant, Region I; El Toco Mine and María Elena plant; and Pampa Blanca and Pedro de Valdivia Mines and plants, Region II  | 11,000 <sup>1</sup>          |
| Do.                          | do.         | Sociedad Contractual Minera Cosayach (Inverraz S.A., 100%)   | Mine and plant near Iquique, Region I   | 3,000                        |
| Do.                          | do.         | Atacama Minerals Chile Sociedad Contractual Minera (Atacama Minerals Corp., 100%)                      | Mine and plant in Aguas Blancas, Region II  | 1,100                        |
| Do.                          | do.         | ACF Minera S.A.  | Lagunas mine and plant near Iquique, Region I   | 1,400                        |
| Iron ore                     |             | Sociedad Contractual Minera Vallenar Iron Co. (Admiralty Resources NL, 100%)                           | Japonesa and Japonesa Mines, near Vallenar, Region III  | 2,000                        |
| Do.                          |             | Cía. Minera del Pacífico S.A. (CMP), 100% (subsidiary of CAP S.A.)                                     | Cristales and El Algarrobo Mines, El Algarrobo and Huasco concentration plants, and Huasco pellet plant, Region III; El Romeral and El Tofo Mines, and El Romeral concentration and pellet-feed plants, Region IV; and El Laco concentration plant, Region II | 9,000                        |
| Do.                          |             | Cía. Minera Huasco S.A. [Cía. Minera del Pacífico S.A. (CMP), 50%, and MC Inversiones Ltda., 50%]      | Los Colorados Mine and concentration plant, Region III  | NA                           |
| Kaolin                       |             | Compañía Minera Polpaico Ltda.   | El Guindo Mine and a plant in the Santiago Metropolitan Region  | NA                           |
| Do.                          |             | Minera Lealtad Ltda.   | Mine and plant at Til Til, Santiago Metropolitan Region   | NA                           |
| Do.                          | metric tons | Mario Alberto Pizarro A.S.A.   | Plant at Los Vilos, Region IV   | 600                          |
| Lapis lazuli                 | do.         | Las Flores de los Andes S.A.   | Mine near Ovalle, Region IV   | 400                          |
| Lead, mine output            | do.         | Minera Florida S.A. (Yamana Gold Inc., 100%)   | Minera Florida Mine and concentration plant, Santiago Metropolitan Region   | NA                           |
| Do.                          | do.         | Sociedad Contractual Minera El Toqui Ltda. (Breakwater Resources Ltd., 100%)                           | El Toqui Mine and Doña Rosa concentration plant, Region XI, 120 kilometers north of Coyhaique   | 3,000                        |
| Lime, hydraulic              |             | Industria Nacional de Cemento S.A. (INACESA) (Cementos Bío Bío S.A., 100%)                             | Plants near Antofagasta City, Region II, and near Copiapo City, Region III  | 880 <sup>1</sup>             |
| Do.                          |             | Soprocal Calerías e Industrias S.A.  | Plant at Melipilla, Santiago Metropolitan Region  | 165                          |
| Lithium carbonate            | metric tons | Sociedad Chilena del Litio Ltda. (subsidiary of Chemetall GmbH, owned by Rockwood Holdings Inc., 100%) | Chemetal Foote plant at La Negra, near the city of Antofagasta, Region II   | 26,000                       |
| Do.                          | do.         | SQM Salar S.A. [subsidiary of Sociedad Química y Minera de Chile S.A. (SQM)] (private, 100%)           | Plant at Salar del Carmen, near the city of Antofagasta, Region II  | 40,000 <sup>1</sup>          |
| Lithium chloride             | do.         | do.  | do.   | NA                           |
| Lithium hydroxide            | do.         | do.  | do.   | 6,000 <sup>1</sup>           |
| Manganese                    | do.         | Manganesos Atacama S.A. (subsidiary of CAP S.A.)   | Plant in Coquimbo city and mines in Region IV   | 10,000                       |
| Marble, dimension stone      | do.         | Pier Luigi Indri S.A.  | Quarry at Cerrillos, Region III   | 250                          |
| Do.                          | do.         | Compañía Minera Feltre Ltda.   | Quarry and plant in Region III  | 1,400                        |
| Molybdenum, mine output      | do.         | Anglo American Sur S.A., 100%  | Los Bronces Mine and Tortolas molybdenum flotation plant, Santiago Metropolitan Region  | 3,000                        |
| Do.                          | do.         | Corporación Nacional del Cobre (CODELCO) (Government, 100%)  | CODELCO Norte Division, Region II   | 20,000                       |
| Do.                          | do.         | do.  | El Teniente Mine and plant, Region VI   | 5,500                        |
| Do.                          | do.         | do.  | Andina Division, Region III   | 2,500                        |
| Do.                          | do.         | do.  | El Salvador Division, Region III  | 1,500                        |
| Do.                          | do.         | Compañía Minera Los Pelambres S.A., 100%   | Los Pelambres Mine and plant, Region IV   | 8,500                        |
| Do.                          | do.         | Compañía Minera Doña Inés de Collahuasi SCM, 100%  | Collahuasi Mine and molybdenum plant, Region I  | 4,000                        |
| Molybdenum oxide, Mo content | do.         | Molibdenos y Metales S.A. (MOLYMET) (private, 100%)  | Nos plant, San Bernardo, 30 kilometers south of Santiago, Santiago Metropolitan Region  | 45,000                       |
| Do.                          | do.         | Corporación Nacional del Cobre (CODELCO) (Government, 100%)  | CODELCO Norte Division, Region II   | 7,500                        |

See footnotes at end of table.

TABLE 2—Continued  
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2009

(Thousand metric tons unless otherwise specified)

| Commodity  |                            | Major operating companies and major equity owners   | Location of main facilities   | Annual capacity <sup>c</sup> |
|--|----------------------------|---|---|------------------------------|
| Natural gas  | million cubic meters       | Empresa Nacional del Petróleo S.A. (ENAP)<br>(Government, 100%)   | About 23 oilfields, including Costa Auera, in the Magallanes basin, Region XII  | 2,200                        |
| Do.  | do.                        | GeoPark Chile Ltd. (operator)<br>(GeoPark Holdings Ltd., 100%)  | Oilfields and gasfields and the Kimiri Aike natural gas plant on the Fell Block, Magellan or Austral Basin, Region XII        | 380                          |
| <b>Nitrates:</b>   |                            |   |   |                              |
| Primarily sodium nitrate   |                            | SQM Nitratos S.A. [subsidiary of Sociedad Química y Minera de Chile S.A. (SQM)] (private, 100%)                 | El Toco Mine and Maria Elena plant; Pampa Blanca and Pedro de Valdivia Mines and plants; and Coya Sur plant, Region II        | 770 <sup>1</sup>             |
| Primarily potassium nitrate  |                            | do.   | do.   | 650 <sup>1</sup>             |
| In fertilizer  |                            | Cosayach Nitratos S.A. (Inverraz S.A., 100%)  | Mine and plant near Iquique, Region I   | 200                          |
| Do.  |                            | SQM Industrial S.A.   | Mine and plant near Santiago, in Region II  | 100                          |
| Do.  |                            | ACF Minera S.A.   | Lagunas Mine and plant near Iquique, Region I   | NA                           |
| Petroleum  | thousand 42-gallon barrels | Empresa Nacional del Petróleo S.A. (ENAP)<br>(Government, 100%)   | About 23 oilfields, including Costa Auera, in the Magallanes basin, Region XII  | 6,500                        |
| Do.  | do.                        | GeoPark Chile Ltd. (operator)<br>(GeoPark Holdings Ltd., 100%)  | Oil and gas fields in the Fell Block, Magellan or Austral Basin, Region XII   | 800                          |
| Petroleum refinery products  | do.                        | do.   | Aconcagua, Bio Bio and Gregorio refineries  | 90,000                       |
| <b>Phosphatic materials, natural:</b>                                      |                            |   |   |                              |
| Guano  |                            | Guano Rojo Punta Gruesa Ltda.   | Mine and plant near Iquique, Region I   | 3                            |
| Phosphate rock, apatite  |                            | César B. Formas Ortiz S.A.  | Mine near Chanaral, Region II   | 20                           |
| Do.  |                            | Compañía Minera El Sauce Ltda.  | Mine near La Serena, Region IV  | 5                            |
| Phosphorite  |                            | Compañía Minera de Fosfatos Naturales Ltda. (Bifox Ltda.) (TEHMCORP S.A., 100%)                                 | Mines at and around Bahía Inglesa; Osorno plant near Bahía Inglesa, Region III; and Bahía Inglesa plant at Caldera, Region IV | 18                           |
| Do.  |                            | Sociedad Contractual Minera Bahía Inglesa   | Selaqueos Mine near Bahía Inglesa, Region III   | NA                           |
| Pig iron   |                            | Cía. Siderúrgica Huachipato S.A. (subsidiary of CAP S.A.)<br>(private, 100%)                                    | Plant in Bahía de San Vicente, Region VIII, 14 kilometers northeast of Concepcion   | 1,200                        |
| Potash (KCl and K <sub>2</sub> SO <sub>4</sub> , K <sub>2</sub> O content) |                            | SQM Salar S.A. [subsidiary of Sociedad Química y Minera de Chile S.A. (SQM)] (private, 100%)                    | Plant at Salar del Carmen, near the city of Antofagasta, Region II  | 955                          |
| Do.  |                            | Sociedad Chilena del Litio Ltda. (Chemetall GmbH, 100%)<br>(Chemetall is owned by Rockwood Holdings Inc., 100%) | Chemetalle Foote plant at La Negra, near the city of Antofagasta, Region II   | 50                           |
| Potassium chloride (KCl)   |                            | Sociedad Contractual Minera Virginia<br>(Inverraz S.A., 100%)   | Mine and plant near Iquique, Region I   | NA                           |
| Do.  |                            | ACF Minera S.A.   | Lagunas Mine and plant near Iquique, Region I   | NA                           |
| Pumicite, including pozzolan   |                            | Empresas El Melón S.A.  | Quarry at Rinconada Lo Vial near Maipu, and plant at Santiago, Santiago Metropolitan Region                                   | 1,200                        |
| Do.  |                            | Compañía Minera Polpaico Ltda.  | Puzolana Norte Mine, Region II; and Puzolana Pudahuel Mine and a plant in the Santiago Metropolitan Region                    | NA                           |
| Do.  |                            | Minera Río Teno S.A. (Cementos Bio Bio S.A., 100%)  | Quarry and plant near Curico, Region VI   | 200                          |
| Do.  |                            | Minera El Way S.A. (Cementos Bio Bio S.A., 100%)  | Quarries and plant near Antofagasta, Region II  | 100                          |
| Do.  |                            | Harborlite Chile Ltda. (IMERY S.A., 100%)   | Laguna del Maule Mine at Talca, Region VII, and plant at Santiago, Santiago Metropolitan Region                               | NA                           |
| Pyrophyllite   | metric tons                | Sociedad Minera Godoy Schwenger y Cía.  | Mine and plant near La Calera, Region V   | 1,800                        |
| Do.  | do.                        | José Orrego Bugeño S.A.   | Mine and plant near Chincolco, Region V   | 1,000                        |
| Do.  | do.                        | Mario Alberto Pizarro A. S.A.   | Plant at Los Vilos, Region IV   | 1,000                        |
| Rhenium, metal   | kilograms                  | Molibdenos y Metales S.A. (MOLYMET)<br>(private, 100%)  | Nos plant, San Bernardo, 30 kilometers south of Santiago, Santiago Metropolitan Region  | 30,000                       |
| Salt, NaCl   |                            | Sociedad Minera Punta de Lobos Ltda.<br>(K+S Aktiengesellschaft, 100%)  | Open pit mine in the Salar Grande de Tarapaca, Region I, and port facilities at Puerto Patillos                               | 7,000 <sup>1</sup>           |
| Do.  |                            | Benjamín Nuñez Ltda.  | Mine near Iquique, Region I   | NA                           |
| Do.  |                            | Inversiones Alpina Ltda.  | Mine in the Salar Grande Irlanda and plant at Iquique Region I  | NA                           |

See footnotes at end of table.

TABLE 2—Continued  
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2009

(Thousand metric tons unless otherwise specified)

| Commodity            |             | Major operating companies and major equity owners                               | Location of main facilities  | Annual capacity <sup>c</sup> |
|----------------------|-------------|---|--|------------------------------|
| Salt, NaCl—Continued |             | Playa Grande Ltda.  | Mine in Region I   | NA                           |
| Do.                  |             | José Álvarez Jara Ltda.   | do.  | NA                           |
| Do.                  |             | Christian Fletcher Ltda.  | do.  | NA                           |
| Do.                  |             | Eliás Echeverría Ltda.  | do.  | NA                           |
| Do.                  |             | Cía. Minera Cordillera Chile S.C.M.   | do.  | NA                           |
| Selenium             | metric tons | Corporación Nacional del Cobre (CODELCO)<br>(Government, 100%)                  | Ventanas smelter and refinery, noble metals plants,<br>Region V (byproduct of copper production)   | 95                           |
| Silica, quartz       |             | Cedric Fernández y Compañía Ltda.   | Mine and plant near Calama, Region II  | 100                          |
| Do.                  |             | Antonio Zotti Rosetti y Cía. Sociedad Minera                                    | La Confianza and San Jose Mines near Los Vilos,<br>Region IV; Margarita and San Nicolas Mines, and<br>a plant near Renca, Santiago Metropolitan Region     | 20                           |
| Do.                  |             | Minera Alfa Quintay Ltda.   | Quarry and plant, Santiago Metropolitan Region   | 30                           |
| Do.                  |             | Minera Pacifico Ltda.   | do.  | NA                           |
| Do.                  |             | Minera Granos Industriales Ltda.  | El Turco Mine and Migrin Plant near Cartagena, Region V  | 250                          |
| Do.                  |             | Productora Cuarzo El Peral Ltda.  | El Peral Mine and plant near Cartagena, Region V   | 250                          |
| Do.                  |             | Sociedad Legal Minera Pedro Luís  | Mine and plant near Copiapo, Region III  | 120                          |
| Do.                  |             | Minera San Pedro Ltda.  | Natacha Mine and El Rulo plant at Til-Til,<br>Santiago Metropolitan Region   | 30                           |
| Do.                  |             | SLM Santa Dorila de las Arenitas  | Mine and plant at Constitución, Region VII   | 250                          |
| Do.                  |             | Cristalerías Toro S.A.  | Mine at Rancagua, Region VI  | 120                          |
| Do.                  |             | Vidrios Lirquén S.A.  | Mine and glass plant at Lirquen, Region VIII   | 80                           |
| Do.                  |             | Minera Arsil S.A.   | Mine and plant at Concepcion, Region VIII  | 50                           |
| Silver:              |             |   |  |                              |
| Metal grains         | kilograms   | Corporación Nacional del Cobre (CODELCO)<br>(Government, 100%)                  | Ventanas refinery, Region V  | 220,000                      |
| Mine output          | do.         | do.   | Andina, CODELCO Norte, El Teniente, and Salvador<br>Divisions  | 300,000                      |
| Do.                  | do.         | Compañía Minera Mantos de Oro<br>(Kinross Gold Corp., 100%)                     | La Coipa Mine and plant, Region III,<br>140 kilometers north of Copiapo  | 200,000                      |
| Do.                  | do.         | Cía. Minera Meridian S.A. (Yamana Gold Inc., 100%)                              | El Peñón Mine and concentration plant, Region II   | 320,000                      |
| Do.                  | do.         | Minera Florida S.A. (Yamana Gold Inc., 100%)                                    | Minera Florida Mine and concentration plant,<br>Santiago Metropolitan Region   | 25,000                       |
| Do.                  | do.         | Minera Escondida Ltda., 100%  | Escondida copper mine and plants, Region II  | 180,000                      |
| Do.                  | do.         | Empresa Nacional de Minería (ENAMI)<br>(Government, 100%)                       | Manuel Antonio Matta plant, Paipote; Osvaldo Martínez<br>plant, El Salado; Vallenar plant, Region III; and José<br>Antonio Moreno plant, Taltal, Region II | 6,000                        |
| Do.                  | do.         | Compañía Minera Cerro Bayo Ltda.<br>(Coeur d'Alene Mines Corp., 100%)           | Cerro Bayo Mine and concentration plant, <sup>3</sup> Region XI  | 60,000                       |
| Do.                  | do.         | Compañía Minera Doña Inés de Collahuasi SCM, 100%                               | Collahuasi Mine and plants, Region I   | 60,000                       |
| Do.                  | do.         | Compañía Minera Los Pelambres S.A., 100%  | Los Pelambres Mine and plant, Region IV  | 42,000                       |
| Do.                  | do.         | Anglo American Sur S.A., 100%   | Los Bronces Mine and plants,<br>Santiago Metropolitan Region   | 35,000                       |
| Do.                  | do.         | Cía. Contractual Minera Candelaria, 100%  | Candelaria Mine and concentration plant, Region III  | 30,000                       |
| Do.                  | do.         | Cía. Contractual Minera Ojos del Salado, 100%                                   | Ojos del Salado copper mine and plant, Region III  | 4,500                        |
| Do.                  | do.         | Sociedad Contractual Minera El Toqui Ltda.<br>(Breakwater Resources Ltd., 100%) | El Toqui Mine and Doña Rosa concentration plant,<br>Region XI, 120 kilometers north of Coyhaique   | 11,000                       |
| Sodium sulfate       | metric tons | SQM Químicos S.A. [Sociedad Química y Minera de<br>Chile S.A. (SQM), 100%]      | Nueva Victoria Mine, Region I, and Maria Elena Mine<br>and Coya Sur plant, Region II <sup>3</sup>  | 80,000                       |
| Do.                  | do.         | Sociedad Legal Minera Santa Inés Uno de Antofagasta                             | Santa Ines Mine near Antofagasta, Region II  | 150                          |
| Steel, crude         |             | Cía. Siderúrgica Huachipato S.A.<br>(subsidiary of CAP S.A.) (private, 100%)    | Primary plant in Talcahuano and plant in Rengo,<br>Region VIII   | 1,450                        |
| Do.                  |             | Gerdau AZA S.A.   | Steel plants in Renca and Colina,<br>Santiago Metropolitan Region  | 520                          |

See footnotes at end of table.

TABLE 2—Continued  
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2009

(Thousand metric tons unless otherwise specified)

| Commodity                      | Major operating companies and major equity owners                                   | Location of main facilities   | Annual capacity <sup>e</sup> |
|--------------------------------|---|---|------------------------------|
| Sulfuric acid                  | Xstrata Copper Chile S.A. (Xstrata plc, 100%)                                       | Altonorte smelter, Region II  | 900 <sup>1</sup>             |
| Do.                            | Anglo American Sur S.A. (Anglo American plc, 100%)                                  | Chagres smelter, Region V   | 500                          |
| Do.                            | Corporación Nacional del Cobre (CODELCO)<br>(Government, 100%)                      | Ventanas sulfuric acid plant, Region V  | 370                          |
| Do.                            | do.   | Caletones plant, Region VI  | 1,000                        |
| Do.                            | do.   | Chuquicamata plant, Region II   | 500                          |
| Do.                            | do.   | Portrerillos plant, Region III  | 100                          |
| Do.                            | Empresa Nacional de Minería (ENAMI)<br>(Government, 100%)                           | Hernán Videla Lira smelter, Paipote, Region III   | 290                          |
| Talc                           | metric tons Sociedad Talco Eduardo Martín Abejón Ltda.                              | Mines near Constitución, Region VII, and plant at Santiago, Santiago Metropolitan Region      | 1,000                        |
| Do.                            | do. Minera Trucco Ltda.   | Mine and plant near Santiago, Santiago Metropolitan Region                                    | NA                           |
| Travertine,<br>dimension stone | do. Mármoles San Marino Chile S.A.<br>(Grupo San Marino S.A., 100%)                 | Quarry near Calama, Region II, and plant in Til-Til, Santiago Metropolitan Region             | 7,000                        |
| Do.                            | do. Andes Travertine & Stones S.A.  | Quarry and plant in Region II   | NA                           |
| Do.                            | do. Canteras de Atacama S.A.  | Quarry and plant at Calama, Region II   | 6,000                        |
| Zeolites                       | do. Sociedad Legal Minera Serrín Tercera  | Serrín Tercera Mine and Remulcao Plant at Talca, Region VII                                   | 300                          |
| Zinc in concentrate            | do. Sociedad Contractual Minera El Toqui Ltda.<br>(Breakwater Resources Ltd., 100%) | El Toqui Mine and Doña Rosa concentration plant, Region XI, 120 kilometers north of Coyhaique | 35,000                       |
| Do.                            | do. Minera Florida S.A. (Yamana Gold Inc., 100%)                                    | Minera Florida Mine and concentration plant, Santiago Metropolitan Region                     | 6,500                        |

<sup>e</sup>Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

<sup>1</sup>Reported figure.

<sup>2</sup>Solvent-extraction/electrowinning.

<sup>3</sup>No production during 2009.

TABLE 3  
CHILE: ESTIMATED RESERVES OF MAJOR MINERAL COMMODITIES<sup>1,2</sup>

(Thousand metric tons unless otherwise specified)

| Commodity   |                            | 2008                 |               |                  | 2009     |               |                  |
|---|----------------------------|----------------------|---------------|------------------|----------|---------------|------------------|
|   |                            | Reserves             | World ranking | World percentage | Reserves | World ranking | World percentage |
| Boron materials (B <sub>2</sub> O <sub>3</sub> content) |                            | 35,000               | NA            | NA               | 35,000   | NA            | NA               |
| Coal, all types <sup>3</sup>                            | million metric tons        | 155 <sup>r</sup>     | NA            | NA               | 155      | NA            | NA               |
| Copper, metal content                                   |                            | 152,000              | 1             | 29               | 153,000  | 1             | 29               |
| Gold, metal content <sup>4</sup>                        | metric tons                | 3,100                | 4             | 6.4              | 3,400    | 4             | 7                |
| Iodine <sup>5</sup>                                     |                            | 1,800 <sup>r</sup>   | 2             | 23               | 1,800    | 2             | 23               |
| Iron ore, Fe content <sup>6</sup>                       |                            | 520,000              | NA            | 0.7              | 535,000  | NA            | 0.7              |
| Lithium, metal content                                  |                            | 7,500                | 1             | 76               | 7,500    | 1             | 76               |
| Molybdenum <sup>7</sup>                                 |                            | 1,950 <sup>r</sup>   | 3             | 20               | 1,950    | 3             | 20               |
| Natural gas <sup>8</sup>                                | million cubic meters       | 98,000               | NA            | NA               | 98,000   | NA            | NA               |
| Nitrates <sup>5</sup>                                   |                            | 225,000 <sup>r</sup> | NA            | NA               | 225,000  | NA            | NA               |
| Petroleum <sup>8</sup>                                  | thousand 42-gallon barrels | 150,000              | NA            | NA               | 150,000  | NA            | NA               |
| Potash  |                            | 130,000 <sup>r</sup> | 7             | 1.6              | 130,000  | 7             | 1.6              |
| Rhenium   | metric tons                | 1,300                | 1             | 52               | 1,300    | 1             | 52               |
| Selenium  | do.                        | 20,000               | 1             | 23               | 20,000   | 1             | 23               |
| Silver <sup>4</sup>                                     | do.                        | 70,000               | NA            | NA               | 70,000   | NA            | NA               |
| Sulfate (SO <sub>4</sub> content)                       |                            | 44,800               | NA            | NA               | 47,100   | NA            | NA               |

<sup>r</sup>Revised. do. Ditto. NA Not available.

<sup>1</sup>Combined proven plus probable reserves estimated from a combination of company, Government, and secondary sources.

<sup>2</sup>Reserves data at the end of the year, unless otherwise specified.

<sup>3</sup>Proved reserves at yearend 2007 only. Source: U.S. Energy Information Administration, Annual Energy Review 2009, August 19, 2010.

<sup>4</sup>Includes reserves estimated based on estimates of other metals contained in porphyry copper deposits (Singer and others, 2005).

<sup>5</sup>Data may include measured and indicated resources and are through 2008 only. Source: Servicio Nacional de Geología y Minería (SERNAGEOMIN), Anuario de la Minería de Chile 2009.

<sup>6</sup>Includes only the exploitable reserves of CAP S.A. in Chile. Source: CAP S.A., Memoria Anual, 2008 and 2009.

<sup>7</sup>Data are through 2008 only. Source: Servicio Nacional de Geología y Minería (SERNAGEOMIN), Anuario de la Minería de Chile 2009.

<sup>8</sup>Proved reserves only. Source: International Energy Statistics, U.S. Energy Information Administration, [undated].